Appendix G
Preliminary Standard Urban Stormwater Mitigation Plan
Appendix

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Preliminary

Standard Urban Stormwater Mitigation Plan (SUSMP)

Tract 72539

Serrano II

Claremont, California

DATE: 10-30-13

Engineer:
PHB & Associates, Inc.
1620 South Grand Avenue
Glendora, California 91740
Phone: (626) 914-6256

Developer:
DRH Horton
2280 Wardlow Circle
Corona, CA 92880
Phone: (951) 272-9000
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Location & Description

The area of interest, the 3.5 acre Tract 72539, is located at the north side of The 210 freeway at Mountain Avenue and South of Baseline Avenue in the City of Claremont, California. This development will develop the 3.5 acre site into 40 single family units.

Existing Condition

The 3.5 acre parcel currently contains an office building, maintenance facility and parking spaces. This parcel drains toward the westerly property line. There are no tributary areas to this parcel.

Onsite Drainage

The onsite storm drain system will be designed to accommodate the pre-developed 100 year storm. Development of these 40 units will require that the runoff from this project be collected in underground infiltration/water quality basins and released at their pre-developed flow rate. All proposed storm drains for this project will be outlet into the existing City of Claremont storm drain system located in Mountain Avenue.

Infiltration/Detention Basins

Two underground STORMTECH MC-4500 chambers will be constructed during the rough grading of the pads for this site. These chambers will be designed to retain on-site the runoff calculated from the 0.75 inch, 24-hour rain event or the 85th percentile, 24-hour rain event, whichever is greater. The 85th percentile, 24-hour rain event (7,406 CF) was found to be greater than the 0.75 inch, 24-hour rain event (5,662 CF). Both underground STORMTECH MC-4500 were designed to accommodate 7,410 CF combined. The STORMTECH chambers will be located under Huron Drive (see SUSMP Plan). HOA will be responsible for operation and maintenance of all BMPs.

The adjacent site (TR 72078) was evaluated for near-surface water infiltration potential. The infiltration rate was found to be 14.1 inches per hour. This infiltration rate was considered suitable for use at the proposed depth of the infiltration chambers. The soils engineer believes that since Tracts 72078 and 72539 are adjacent to each other, in all likelihood, the soils study and infiltration rate will be similar. The soils engineer will provide documentation in the near future.

The infiltration chambers will be designed to overflow into a 24” RCP (bypass for tract 72078) located at the westerly property line and traverses the entirety of TR 72078 all the way to an existing City of Claremont storm drain pipe located in Mountain Avenue.
Best Management Practices (BMPs)

This site was designed to include BMPs such as swales that collect and slowly convey runoff flows to downstream discharge points (curb and gutter). The site also has infiltration chambers that capture, store and infiltrate stormwater runoff. Other BMPs include maximizing permeable areas, usage of alternative materials to reduce runoffs, reducing street width and maximizing canopy interception (see page 9).

Summary

This project will consist of the construction of 40 single family units and parking including common open space.
Modified Rational Method Hydrology Summary
MODRAT: Los Angeles County Tc Calculator

Total Area = 3.4 acres
Type of Development = Single Family
Predominant Soil Type = 007

SUBAREA A
Area= 1.236 acres
Impervious surfaces = 62%
Pervious surface= 38%

SUBAREA B
Area= 1.043 acres
Impervious surfaces = 65%
Pervious surface= 35%

SUBAREA C
Area= 1.129 acres
Impervious surfaces = 68%
Pervious surface= 32%
## 0.75 in. 24 Hour Rain Event

### Input Info

<table>
<thead>
<tr>
<th>Subarea</th>
<th>Area (acre)</th>
<th>Imperviousness</th>
<th>Frequency</th>
<th>Soil Type</th>
<th>Length(ft)</th>
<th>Slope</th>
<th>Isohyet(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area A</td>
<td>1.236</td>
<td>0.62</td>
<td>0.75 in/24hr</td>
<td>7</td>
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<tr>
<td>Area B</td>
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<td>0.75 in/24hr</td>
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<td>190</td>
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<td>Area C</td>
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<td>0.68</td>
<td>0.75 in/24hr</td>
<td>7</td>
<td>200</td>
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### Output Info

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<thead>
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<th>Subarea</th>
<th>Tc Calc.(min)</th>
<th>Intensity in/hr</th>
<th>Cu</th>
<th>Cd</th>
<th>Flow Rate (cfs)</th>
<th>Vol. (acre.ft)</th>
<th>Vol. (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area A</td>
<td>20</td>
<td>0.23</td>
<td>0.1</td>
<td>0.60</td>
<td>0.17</td>
<td>0.05</td>
<td>2,178</td>
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<tr>
<td>Area B</td>
<td>18</td>
<td>0.25</td>
<td>0.1</td>
<td>0.62</td>
<td>0.16</td>
<td>0.04</td>
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<tr>
<td>Area C</td>
<td>15</td>
<td>0.27</td>
<td>0.1</td>
<td>0.64</td>
<td>0.20</td>
<td>0.04</td>
<td>1,742</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>5,662</td>
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</table>
### 85th Percentile, 24 Hour Rain Event

#### Input Info

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<th>Subarea</th>
<th>Area (acres)</th>
<th>Imperviousness</th>
<th>Frequency</th>
<th>Soil Type</th>
<th>Length(ft)</th>
<th>Slope</th>
<th>Isohyet(in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area A</td>
<td>1.236</td>
<td>0.62</td>
<td>85th Percent.</td>
<td>7</td>
<td>200</td>
<td>0.0150</td>
<td>0.94</td>
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<td>1.043</td>
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<td>85th Percent.</td>
<td>7</td>
<td>190</td>
<td>0.0153</td>
<td>0.94</td>
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<tr>
<td>Area C</td>
<td>1.129</td>
<td>0.68</td>
<td>85th Percent.</td>
<td>7</td>
<td>200</td>
<td>0.0423</td>
<td>0.94</td>
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</tbody>
</table>

#### Output Info

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<thead>
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<th>Subarea</th>
<th>Tc Calc.(min)</th>
<th>Intensity in/hr</th>
<th>Cu</th>
<th>Cd</th>
<th>Flow Rate (cfs)</th>
<th>Vol. (acre-ft)</th>
<th>Vol. (cf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area A</td>
<td>17</td>
<td>0.32</td>
<td>0.1</td>
<td>0.60</td>
<td>0.24</td>
<td>0.06</td>
<td>2,614</td>
</tr>
<tr>
<td>Area B</td>
<td>16</td>
<td>0.32</td>
<td>0.1</td>
<td>0.62</td>
<td>0.21</td>
<td>0.05</td>
<td>2,178</td>
</tr>
<tr>
<td>Area C</td>
<td>13</td>
<td>0.36</td>
<td>0.1</td>
<td>0.64</td>
<td>0.26</td>
<td>0.06</td>
<td>2,614</td>
</tr>
<tr>
<td><strong>Total</strong></td>
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<td></td>
<td></td>
<td></td>
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# StormTech Site Calculator

## System Requirements

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<thead>
<tr>
<th>Units</th>
<th>Value</th>
<th>Description</th>
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</thead>
<tbody>
<tr>
<td>Imperial</td>
<td>4200 CF</td>
<td>Required Storage Volume</td>
</tr>
<tr>
<td></td>
<td>40%</td>
<td>Stone Porosity (Industry Standard = 40%)</td>
</tr>
<tr>
<td></td>
<td>18 inches</td>
<td>Stone Above Chambers (12 inch min.)</td>
</tr>
<tr>
<td></td>
<td>12 inches</td>
<td>Stone Foundation Depth (9 inch min.)</td>
</tr>
<tr>
<td></td>
<td>24 inches</td>
<td>Average Cover over Chambers (24 inch min.)</td>
</tr>
<tr>
<td></td>
<td>WIDTH</td>
<td>Bed size controlled by WIDTH or LENGTH?</td>
</tr>
<tr>
<td></td>
<td>10.5 feet</td>
<td>Limiting WIDTH or LENGTH dimension</td>
</tr>
<tr>
<td></td>
<td>180 CF</td>
<td>Storage Volume per Chamber</td>
</tr>
<tr>
<td></td>
<td>124.8 CF</td>
<td>Storage Volume per End Cap</td>
</tr>
</tbody>
</table>

## System Sizing

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Chambers Required</td>
<td>22 each</td>
</tr>
<tr>
<td>Number of End Caps Required</td>
<td>2 each</td>
</tr>
<tr>
<td>Bed Size (Including perimeter stone)</td>
<td>989 square feet</td>
</tr>
<tr>
<td>Stone Required (including perimeter stone)</td>
<td>288 tons</td>
</tr>
<tr>
<td>Volume of Excavation</td>
<td>311 cubic yards</td>
</tr>
<tr>
<td>Non-woven Filter Fabric Required (20% Safety Factor)</td>
<td>490 square yards</td>
</tr>
<tr>
<td>Length of Isolator Row</td>
<td>95.7 feet</td>
</tr>
<tr>
<td>Woven Isolator Row Fabric (20% Safety Factor)</td>
<td>263 square yards</td>
</tr>
<tr>
<td>Installed Storage Volume</td>
<td>4,227 cubic feet</td>
</tr>
</tbody>
</table>

## Controlled by Width (Rows)

- Maximum Width = 10.5 feet
- 1 row of 22 chambers
- Maximum Length = 95.7 feet
- Maximum Width = 10.3 feet
### System Requirements

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Units</th>
<th>Imperial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Required Storage Volume</td>
<td></td>
<td>3210 CF</td>
</tr>
<tr>
<td>Stone Porosity (Industry Standard = 40%)</td>
<td>%</td>
<td>40</td>
</tr>
<tr>
<td>Stone Above Chambers (12 inch min.)</td>
<td></td>
<td>18 inches</td>
</tr>
<tr>
<td>Stone Foundation Depth (9 inch min.)</td>
<td></td>
<td>16 inches</td>
</tr>
<tr>
<td>Average Cover over Chambers (24 inch min.)</td>
<td>inches</td>
<td>24</td>
</tr>
<tr>
<td>Bed Size controlled by WIDTH or LENGTH?</td>
<td>WIDTH</td>
<td>10.5 feet</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Storage Volume per Chamber</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>180.8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Storage Volume per End Cap</th>
<th>CF</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>124.8</td>
<td></td>
</tr>
</tbody>
</table>

### System Sizing

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Chambers Required</td>
<td>17</td>
</tr>
<tr>
<td>Number of End Caps Required</td>
<td>2</td>
</tr>
<tr>
<td>Tied Size (including perimeter stone)</td>
<td>781 square feet</td>
</tr>
<tr>
<td>Stone Required (including perimeter stone)</td>
<td>229 tons</td>
</tr>
<tr>
<td>Volume of Excavation</td>
<td>246 cubic yards</td>
</tr>
<tr>
<td>Non-woven Filter Fabric Required (20% Safety Factor)</td>
<td>391 square yards</td>
</tr>
<tr>
<td>Length of Isolator Row</td>
<td>75.5 feet</td>
</tr>
<tr>
<td>Woven Isolator Row Fabric (20% Safety Factor)</td>
<td>207 square yards</td>
</tr>
<tr>
<td>Installed Storage Volume</td>
<td>3,323 cubic feet</td>
</tr>
</tbody>
</table>

### Controlled by Width (Rows)

- **Maximum Width =** 10.5 feet
  - 1 row of 17 chambers
- **Maximum Length =** 75.5 feet
- **Maximum Width =** 10.3 feet
Vicinity Map
VICINITY MAP  
T.G. 571/B7
Modified Rational Method Hydrology

0.75 in. 24 Hour Rain Event
$C_D = (0.9 \times IMP) + (1.0 - IMP) \times C_U$

Where:
- $C_D$ = Developed Runoff Coefficient
- $IMP$ = Proportion Impervious
- $C_U$ = Undeveloped runoff coefficient
<table>
<thead>
<tr>
<th>Subarea Parameters Manual Input</th>
<th>Subarea Parameters Selected</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Subarea Number</strong></td>
<td><strong>Subarea Number</strong></td>
</tr>
<tr>
<td>A</td>
<td>1a</td>
</tr>
<tr>
<td><strong>Area (Acres)</strong></td>
<td><strong>Area (Acres)</strong></td>
</tr>
<tr>
<td>1.236</td>
<td>1.236</td>
</tr>
<tr>
<td><strong>Rainfall Isohyet (in.)</strong></td>
<td><strong>Rainfall Isohyet (in.)</strong></td>
</tr>
<tr>
<td>0.75</td>
<td>0.75</td>
</tr>
<tr>
<td><strong>Flow Path Length (ft.)</strong></td>
<td><strong>Flow Path Length (ft.)</strong></td>
</tr>
<tr>
<td>200</td>
<td>200</td>
</tr>
<tr>
<td><strong>Flow Path Slope</strong></td>
<td><strong>Flow Path Slope</strong></td>
</tr>
<tr>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td><strong>Fire Factor</strong></td>
<td><strong>Fire Factor</strong></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Proportion Impervious</strong></td>
<td><strong>Proportion Impervious</strong></td>
</tr>
<tr>
<td>0.62</td>
<td>0.62</td>
</tr>
<tr>
<td><strong>Soil Type</strong></td>
<td><strong>Soil Type</strong></td>
</tr>
<tr>
<td>7</td>
<td>7</td>
</tr>
</tbody>
</table>

**Input File**
- [ ] Check Here If Subarea Parameters Are Defined In An Input File
  - [ ] Calculate Single Tc From Subarea Parameters Provided In Input File
  - [ ] Calculate Tcs For Multiple Subareas And Create Tc Results File

**Calculation Results**

<table>
<thead>
<tr>
<th>Subarea Number</th>
<th>Intensity</th>
<th>Undeveloped Runoff Coefficient (Cu)</th>
<th>Developed Runoff Coefficient (Cd)</th>
<th>Calculate Runoff Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.23</td>
<td>0.1</td>
<td>0.6</td>
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</tr>
</tbody>
</table>

Tc Equation:

\[ Tc = (10)^{-0.507*(Cd^2)^{-0.519*(L)^0.483*(S)^{-0.135}}} \]

<table>
<thead>
<tr>
<th>Tc Value (min.)</th>
<th>Peak Flow Rate (cfs)</th>
<th>Burned Peak Flow Rate (cfs)</th>
<th>24-Hour Runoff Volume (acre-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>0.17</td>
<td>n/a</td>
<td>0.05</td>
</tr>
</tbody>
</table>
### Tc Calculator

#### Subarea Parameters Manual Input

<table>
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<th>Subarea Number</th>
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<th>Area (Acres)</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0</td>
<td>1.043</td>
<td>0.65</td>
<td>7</td>
</tr>
<tr>
<td>Rainfall Isohyet (in.)</td>
<td>0.75</td>
<td>190</td>
<td>0.0153</td>
<td></td>
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</tbody>
</table>

#### Subarea Parameters Selected

<table>
<thead>
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<th>Subarea Number</th>
<th>Fire Factor</th>
<th>Area (Acres)</th>
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<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>0</td>
<td>1.043</td>
<td>0.65</td>
<td>7</td>
</tr>
<tr>
<td>Rainfall Isohyet (in.)</td>
<td>0.75</td>
<td>190</td>
<td>0.0153</td>
<td></td>
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- [ ] Calculate Single Tc From Subarea Parameters Provided In Input File
- [ ] Calculate Tc's For Multiple Subareas And Create Tc Results File

#### Calculation Results

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<tr>
<th>Subarea Number</th>
<th>Intensity</th>
<th>Undeveloped Runoff Coefficient (Cu)</th>
<th>Developed Runoff Coefficient (Cd)</th>
<th>Calculate Runoff Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>0.25</td>
<td>0.1</td>
<td>0.62</td>
<td>[ ] Calculate Tc</td>
</tr>
</tbody>
</table>

Tc Equation:

\[ Tc = (10)^{-0.507(4d)^{-0.519(L)^{0.483(S)^{-0.135}}} \]

<table>
<thead>
<tr>
<th>Tc Value (min.)</th>
<th>Peak Flow Rate (cfs)</th>
<th>Burned Peak Flow Rate (cfs)</th>
<th>24-Hour Runoff Volume (acre-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>0.16</td>
<td>n/a</td>
<td>0.04</td>
</tr>
</tbody>
</table>
### Tc Calculator

#### Subarea Parameters Manual Input

<table>
<thead>
<tr>
<th>Subarea Number</th>
<th>Fire Factor</th>
<th>Area (Acres)</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0</td>
<td>1.129</td>
<td>0.68</td>
<td>7</td>
</tr>
<tr>
<td>Rainfall Isohyet (in.)</td>
<td>0.75</td>
<td>Flow Path Length (ft.)</td>
<td>200</td>
<td>Flow Path Slope</td>
</tr>
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</table>

#### Subarea Parameters Selected

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<th>Subarea Number</th>
<th>Fire Factor</th>
<th>Area (Acres)</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
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<tbody>
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<td>1a</td>
<td>0</td>
<td>1.129</td>
<td>0.68</td>
<td>7</td>
</tr>
<tr>
<td>Rainfall Isohyet (in.)</td>
<td>0.75</td>
<td>Flow Path Length (ft.)</td>
<td>200</td>
<td>Flow Path Slope</td>
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#### Input File

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- [ ] Import "tccdata.xls" File
- [ ] Calculate Single Tc From Subarea Parameters Provided In Input File
- [ ] Calculate Tc's For Multiple Subareas And Create Tc Results File

#### Calculation Results

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<tr>
<th>Subarea Number</th>
<th>Intensity</th>
<th>Undeveloped Runoff Coefficient (Cu)</th>
<th>Developed Runoff Coefficient (Cd)</th>
<th>[ ] Calculate Runoff Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.27</td>
<td>0.1</td>
<td>0.64</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tc=(10)^-0.507*(Cd^1.1)^-0.519*(L)^0.483*(S)^-0.135</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Tc Value (min.)</th>
<th>Peak Flow Rate (cfs)</th>
<th>Burned Peak Flow Rate (cfs)</th>
<th>24-Hour Runoff Volume (acre-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>0.2</td>
<td>n/a</td>
<td>0.04</td>
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</table>
Modified Rational Method Hydrology

85th percentile, 24 Hour Rain Event
85th Percentile 24-hr Rainfall Isohyetal Map

\[ 85\text{th Percentile 24-hr Rainfall Depth} \]
### Subarea Parameters Manual Input

<table>
<thead>
<tr>
<th>Subarea Number</th>
<th>Fire Factor</th>
<th>Area (Acres)</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
<th>Rainfall Isohyet (in.)</th>
<th>Flow Path Length (ft.)</th>
<th>Flow Path Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0</td>
<td>1.236</td>
<td>0.62</td>
<td>7</td>
<td>0.94</td>
<td>200</td>
<td>0.015</td>
</tr>
</tbody>
</table>

### Subarea Parameters Selected

<table>
<thead>
<tr>
<th>Subarea Number</th>
<th>Fire Factor</th>
<th>Area (Acres)</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
<th>Rainfall Isohyet (in.)</th>
<th>Flow Path Length (ft.)</th>
<th>Flow Path Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>1a</td>
<td>0</td>
<td>1.236</td>
<td>0.62</td>
<td>7</td>
<td>0.94</td>
<td>200</td>
<td>0.015</td>
</tr>
</tbody>
</table>

### Input File

- [ ] Check Here If Subarea Parameters Are Defined In An Input File
- [ ] Calculate Single Tc From Subarea Parameters Provided In Input File
- [ ] Calculate Tcs For Multiple Subareas And Create Tc Results File

### Calculation Results

- Intensity: A
- Undeveloped Runoff Coefficient (C_u): 0.32
- Developed Runoff Coefficient (C_d): 0.1
- Soil Type: 0.6

### Tc Equation

\[ Tc = (10)^{-0.507*(C_d*I)^{0.519}*(L)^{0.483}*(S)^{-0.135}} \]

- Tc Value (min.): 17
- Peak Flow Rate (cfs): 0.24
- Burned Peak Flow Rate (cfs): n/a
- 24-Hour Runoff Volume (acre-ft): 0.06
- Calculate Tc
- Calculate Runoff Volume
- Cancel
## Tc Calculator

### Subarea Parameters Manual Input

<table>
<thead>
<tr>
<th>Subarea</th>
<th>Fire Factor</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
<th>Area (Acres)</th>
<th>Flow Path Length (ft.)</th>
<th>Flow Path Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td></td>
<td></td>
<td></td>
<td>1.043</td>
<td>190</td>
<td>0.0153</td>
</tr>
<tr>
<td>0.94</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

### Subarea Parameters Selected

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<thead>
<tr>
<th>Subarea</th>
<th>Fire Factor</th>
<th>Proportion Impervious</th>
<th>Soil Type</th>
<th>Area (Acres)</th>
<th>Flow Path Length (ft.)</th>
<th>Flow Path Slope</th>
</tr>
</thead>
<tbody>
<tr>
<td>la</td>
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<td>1.043</td>
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<td>0.0153</td>
</tr>
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### Input File

- **Check Here If Subarea Parameters Are Defined In An Input File**
- **Import "tcdata.xls" File**
- **Calculate Single Tc From Subarea Parameters Provided In Input File**
- **Calculate Tc's For Multiple Subareas And Create Tc Results File**

### Calculation Results

<table>
<thead>
<tr>
<th>Subarea</th>
<th>Intensity</th>
<th>Undeveloped Runoff Coefficient (Cu)</th>
<th>Developed Runoff Coefficient (Cd)</th>
<th>Calculate Runoff Volume</th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>0.32</td>
<td>0.1</td>
<td>0.62</td>
<td></td>
</tr>
</tbody>
</table>

**Tc Equation**: \[ Tc = (10)^{-0.507(Cd*I)^{0.519}(L)^{0.483}(S)^{0.135}} \]

<table>
<thead>
<tr>
<th>Tc Value (min.)</th>
<th>Peak Flow Rate (cfs)</th>
<th>Burned Peak Flow Rate (cfs)</th>
<th>24-Hour Runoff Volume (acre-ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>16</td>
<td>0.21</td>
<td>n/a</td>
<td>0.05</td>
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</tbody>
</table>
Best Management Practices (BMPs)

Site Design BMPs
Source Control BMPs
Treatment Control BMPs
BMP Inspection and Maintenance
### Site Design BMPs

<table>
<thead>
<tr>
<th>Minimize Storm Water Runoff and Impervious Footprint</th>
<th>Used</th>
<th>Not Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Maximize the permeable area. This can be achieved in various ways, including but not limited to, increasing building density (number of stories above or below ground) and developing land use regulations seeking to limit impervious surfaces. <strong>Comment:</strong> The impervious street area was reduced due to onsite streets being private, which allowed reduction in the size and shape of the cul-de-sac bulb. Front lot setbacks were maximized to reduce driveway lengths which in turn provided more permeable areas in the backyards. These adjustments comply with safety and for fire and emergency vehicle access.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>2. Runoff from developed areas may be reduced by using alternative materials or surfaces with a lower Coefficient of Runoff, or “C-Factor”. <strong>Comment:</strong> Permeable pavers will be used for walkways. Stepping pads will be used for walkways to backyards instead of concrete landscape.</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>3. Conserve natural areas. This can be achieved by concentrating or clustering development on the least environmentally sensitive portions of a site while leaving the remaining land in a natural, undisturbed condition. <strong>Comment:</strong> Due to the site design constraints of this infill site, and no environmentally sensitive areas being present, no clustering was warranted.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4. Construct walkways, trails, patios, overflow parking lots, alleys, driveways, low-traffic streets, and other low-traffic areas with open-jointed paving materials or permeable surfaces, such as pervious concrete, porous asphalt, unit pavers, and granular materials. <strong>Comment:</strong> Parts of sidewalks and walkways will be constructed using unit pavers and walkways to backyards will be constructed using concrete stepping pads with spaces in between them.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5. Construct streets, sidewalks, and parking lot aisles to the minimum widths necessary, provided that public safety and a pedestrian friendly environment are not compromised. Incorporate landscaped buffer areas between sidewalks and streets. <strong>Comment:</strong> Private streets and sidewalks will be custom made and minimum widths will be used to increase pervious surfaces.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6. Reduce widths of street where off-street parking is available. <strong>Comment:</strong> Private street widths were narrowed to include buffer areas between sidewalks and streets.</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>7. Maximize canopy interception and water conservation by preserving existing native trees and shrubs, and planting additional native or drought tolerant trees and large shrubs. <strong>Comment:</strong> No significant existing trees were located on the site in the existing</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>
condition. However, native and drought tolerant trees will be planted at the conclusion of the construction phase.

8. Minimize the use of impervious surfaces, such as decorative concrete, in the landscape design.

**Comment:** Minimal amount of impervious surfaces were used in site design. The only impervious surfaces in the landscape design are minimal entry monuments in the parkway at proposed Huron Street intersection with Mountain Avenue.

9. Use natural drainage systems.

**Comment:** Swales for residential lots will be pervious surface (sod).

10. Construct onsite ponding areas, rain gardens, or retention facilities to increase opportunities for infiltration, while being cognizant of the need to prevent the development of vector breeding areas.

**Comment:** Stormtech infiltration chambers to be used.

11. Where landscaping is proposed, drain rooftops into adjacent landscaping prior to discharging to the storm drain.

**Comment:** Roof runoff will discharge toward grassy swales around houses and onto storm drain system.

12. Where landscaping is proposed; drain impervious sidewalks, walkways, trails and patios into adjacent landscaping.

**Comment:** Walkways drain toward adjacent landscaping.

13. Increase the use of vegetated drainage swales in lieu of underground piping or imperviously lined swales.

**Comment:** Onsite lot swales will be vegetated (sod) swales.
## Form 4.1-1 Non-Structural Source Control BMPs

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>Describe BMP Implementation OR, if not applicable, state reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>Education of Property Owners, Tenants and Occupants on Stormwater BMPs</td>
<td>Included, Not Applicable</td>
<td>Property owners to be provided environmental awareness education materials by the developer and they can be downloaded at: <a href="http://www.sbcountystormwater.org/gov_out.html">http://www.sbcountystormwater.org/gov_out.html</a></td>
</tr>
<tr>
<td>N2</td>
<td>Activity Restrictions</td>
<td>Included, Not Applicable</td>
<td>Conditions, covenants and restrictions will be prepared by developer for the purpose of water quality protection such as restrictions on car washing in undesignated areas</td>
</tr>
<tr>
<td>N3</td>
<td>Landscape Management BMPs</td>
<td>Included, Not Applicable</td>
<td>Fertilizer and pesticide usage will be consistent with local ordinance</td>
</tr>
<tr>
<td>N4</td>
<td>BMP Maintenance</td>
<td>Included, Not Applicable</td>
<td>Responsible parties for maintenance and cleaning to be identified</td>
</tr>
<tr>
<td>N5</td>
<td>Title 22 CCR Compliance (How development will comply)</td>
<td>Included, Not Applicable</td>
<td>Development to comply with local waste management protocol</td>
</tr>
<tr>
<td>N6</td>
<td>Local Water Quality Ordinances</td>
<td>Included, Not Applicable</td>
<td>Development to comply with local water quality ordinances</td>
</tr>
<tr>
<td>N7</td>
<td>Spill Contingency Plan</td>
<td>Not Included, Included</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>N8</td>
<td>Underground Storage Tank Compliance</td>
<td>Not Included, Included</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>N9</td>
<td>Hazardous Materials Disclosure Compliance</td>
<td>Not Included, Included</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
</tbody>
</table>
## Form 4.1-1 Non-Structural Source Control BMPs

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Included</th>
<th>Not Applicable</th>
<th>Describe BMP Implementation OR, if not applicable, state reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>N10</td>
<td>Uniform Fire Code Implementation</td>
<td>[ ]</td>
<td>[ ]</td>
<td>Not applicable because there are no indoor storage of compressed gases</td>
</tr>
<tr>
<td>N11</td>
<td>Litter/Debris Control Program</td>
<td>[ ]</td>
<td>[ ]</td>
<td>HOA to provide services such as emptying trash receptacles in common areas and noting trash disposal violations by home owners for investigation</td>
</tr>
<tr>
<td>N12</td>
<td>Employee Training</td>
<td>[ ]</td>
<td>[ ]</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>N13</td>
<td>Housekeeping of Loading Docks</td>
<td>[ ]</td>
<td>[ ]</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>N14</td>
<td>Catch Basin Inspection Program</td>
<td>[ ]</td>
<td>[ ]</td>
<td>HOA to inspect, clean and maintain public storm drain inlets such as catch basins.</td>
</tr>
<tr>
<td>N15</td>
<td>Vacuum Sweeping of Private Streets and Parking Lots</td>
<td>[ ]</td>
<td>[ ]</td>
<td>HOA to provide street cleaning services every fall before the rainy season</td>
</tr>
<tr>
<td>N16</td>
<td>Other Non-structural Measures for Public Agency Projects</td>
<td>[ ]</td>
<td>[ ]</td>
<td>Not applicable</td>
</tr>
<tr>
<td>N17</td>
<td>Comply with all other applicable NPDES permits</td>
<td>[ ]</td>
<td>[ ]</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>
## Form 4.1-2 Structural Source Control BMPs

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>Describe BMP Implementation OR, if not applicable, state reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1</td>
<td>Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)</td>
<td>✗</td>
<td>Signage indicating no dumping to be put on all storm drain inlets</td>
</tr>
<tr>
<td>S2</td>
<td>Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)</td>
<td>✗</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>S3</td>
<td>Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)</td>
<td>✗</td>
<td>Not applicable because there are no trash enclosures designed for this development. All trash to be collected by home owners and kept in trash containers for pick up by city trash collection trucks.</td>
</tr>
<tr>
<td>S4</td>
<td>Use efficient irrigation systems &amp; landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)</td>
<td>✗</td>
<td>All lots to have smart controllers for irrigation to minimize runoff of excess irrigation water.</td>
</tr>
<tr>
<td>S5</td>
<td>Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement</td>
<td>✗</td>
<td>Landscaped areas shall be 1.5 inches below top of curb or sidewalk for increased retention and infiltration of stormwater and irrigation water.</td>
</tr>
<tr>
<td>S6</td>
<td>Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)</td>
<td>✗</td>
<td>Not applicable because the site does not have slopes and channels that need to be protected.</td>
</tr>
<tr>
<td>S7</td>
<td>Covered dock areas (CASQA New Development BMP Handbook SD-31)</td>
<td>✗</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>S8</td>
<td>Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)</td>
<td>✗</td>
<td>Not applicable because site is for residential development not industrial or commercial</td>
</tr>
<tr>
<td>S9</td>
<td>Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)</td>
<td>✗</td>
<td>Not applicable because site is for residential development not industrial</td>
</tr>
<tr>
<td>S10</td>
<td>Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)</td>
<td>✗</td>
<td>Not applicable because site is for residential development not industrial</td>
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## Form 4.1-2 Structural Source Control BMPs

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Name</th>
<th>Check One</th>
<th>Describe BMP Implementation OR, if not applicable, state reason</th>
</tr>
</thead>
<tbody>
<tr>
<td>S11</td>
<td>Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)</td>
<td>☐ ☒</td>
<td>Not applicable because site is for residential development not industrial</td>
</tr>
<tr>
<td>S12</td>
<td>Fueling areas (CASQA New Development BMP Handbook SD-30)</td>
<td>☐ ☒</td>
<td>Not applicable because site is for residential development not Industrial</td>
</tr>
<tr>
<td>S13</td>
<td>Hillside landscaping (CASQA New Development BMP Handbook SD-10)</td>
<td>☐ ☒</td>
<td>Not applicable because site will not have hillside landscaping</td>
</tr>
<tr>
<td>S14</td>
<td>Wash water control for food preparation areas</td>
<td>☐ ☒</td>
<td>Not applicable because site is for residential development not commercial</td>
</tr>
<tr>
<td>S15</td>
<td>Community car wash racks (CASQA New Development BMP Handbook SD-33)</td>
<td>☐ ☒</td>
<td>Not applicable because there will not be a community car wash area</td>
</tr>
</tbody>
</table>
Pollutants of Concern

<table>
<thead>
<tr>
<th>Pollutants Type</th>
<th>Expected</th>
<th>Not Expected</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria/Virus</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Metals</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Nutrients</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Pesticides</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Organic compounds</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>Sediments/Turbidity/pH</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Trash/Debris</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Oxygen Demanding Substances</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

Stormtech chambers will be able to remove sediments, nutrients, pesticides, trash/debris, oil/grease bacteria/viruses and oxygen demanding substances such as litter, greenwaste and food waste.

Treatment Control BMPs

<table>
<thead>
<tr>
<th>Implemented</th>
<th>Treatment Control BMP</th>
<th>Design Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grassy Swales</td>
<td>Vegetated Buffer Strip</td>
<td>Flow Based</td>
</tr>
<tr>
<td></td>
<td>Vegetated Swale</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multiple systems</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Manufactured/Proprietary</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Bioretention</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Wet Pond</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Constructed Wetland</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Extended Detention Basin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Water Quality Inlet</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Retention/Irrigation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infiltration basin</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Infiltration Trench</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Media Filter</td>
<td></td>
</tr>
<tr>
<td>MC-4500 Stormtech</td>
<td>Manufactured/Proprietary</td>
<td></td>
</tr>
<tr>
<td>BMP</td>
<td>Inspection and Maintenance</td>
<td></td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------</td>
<td></td>
</tr>
<tr>
<td>Daily</td>
<td>Trash Pick up</td>
<td></td>
</tr>
<tr>
<td>Stormtech Chambers</td>
<td>Responsible Party Actions Required</td>
<td></td>
</tr>
<tr>
<td>Every 6 months</td>
<td>Clean Swales</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home Owners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home Owners</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide Education Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Provide Rules Guide to Home Owners</td>
<td></td>
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<tr>
<td></td>
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<td></td>
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<td>Provide Education Material</td>
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<tr>
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<td></td>
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<tr>
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<tr>
<td></td>
<td>Provide Education Material</td>
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<tr>
<td></td>
<td>Provide Education Material</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clean Swales</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Home Owners</td>
<td></td>
</tr>
</tbody>
</table>
References

2. County of Los Angeles Tc Calculator.
3. StormTech- Subsurface Stormwater Management
Hydrology Maps and Exhibits

SUSMP Mitigation Plan
Drainage Exhibit
Stormtech

Specifications
Operation, Inspection and Maintenance
**Nominal Chamber Specifications**

Size (W x H x Installed Length): 100.0" x 60.0" x 48.3" [2540 mm x 1524 mm x 1227 mm]

Chamber Storage: 108.5 ft³ [3.01 m³]

Minimum Installed Storage*: 62.6 ft³ [1.80 m³]

Nominal Weight: 120 lbs [54.4 kg]

**Nominal End Cap Specifications**

Size (W x H x Installed Length): 90.2" x 59.4" x 30.7" [2291 mm x 1509 mm x 781 mm]

End Cap Storage: 35.7 ft³ [1.01 m³]

Minimum Installed Storage*: 108.7 ft³ [3.08 m³]

Nominal Weight: 120 lbs [54.4 kg]

*Assumes 9" (229 mm) Stone Foundation, 9" (229 mm) Row Spacing, 12" (305 mm) Stone Above, 12" (305 mm) Stone Perimeter in Front of End Caps and 40% Stone Porosity.

Part numbers ending with "B" are for stubs at bottom of end cap. Part numbers ending with "T" are for stubs at top of end cap.

<table>
<thead>
<tr>
<th>PART #</th>
<th>STUB</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
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<tr>
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<td>150 mm</td>
<td>N/A</td>
</tr>
<tr>
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<td>200 mm</td>
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<td>MC4500REPE12T</td>
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<td>3.27[84 mm]</td>
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</table>

1. Custom invert locations on the MC-4500 end cap cut in the field are not recommended for pipe sizes greater than 10" (250 mm).
2. The invert locations in column B are the highest possible for the pipe size.

Note: All dimensions are nominal.
MC-4500 STORMWATER CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500 OR APPROVED EQUAL.

2. CHAMBERS SHALL BE MADE FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.

3. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSERVED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.


5. CHAMBERS SHALL CONFORM TO THE REQUIREMENTS OF ASTM F 2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".

7. ONLY CHAMBERS THAT ARE APPROVED BY THE ENGINEER WILL BE ALLOWED. THE CONTRACTOR SHALL SUBMIT (3 SETS) OF THE FOLLOWING TO THE ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:

   a. A STRUCTURAL EVALUATION BY A REGISTERED STRUCTURAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12 ARE MET.

   b. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL CROSS SECTION IS BASED.

8. THE INSTALLATION OF CHAMBERS SHALL BE IN ACCORDANCE WITH THE MANUFACTURER'S LATEST INSTALLATION INSTRUCTIONS.
# Acceptable Fill Materials: StormTech MC-4500 Chamber Systems

<table>
<thead>
<tr>
<th>Material Location</th>
<th>Description</th>
<th>AASHTO M43 Designation</th>
<th>Compaction/Density Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>D</strong> Fill material for layer 'D' starts from the top of the 'C' layer to the bottom of flexible pavement or unpaved finished grade above. Note that pavement subbase may be part of the 'D' layer.</td>
<td>Any soil/rock materials, native soils, or per engineer's plans. Check plans for pavement subgrade requirements.</td>
<td>N/A</td>
<td>Prepare per engineer's plans. Paved installations may have stringent material and preparation requirements.</td>
</tr>
<tr>
<td><strong>C</strong> Fill material for layer 'C' starts from the top of the embedment stone ('B' layer) to 6&quot; (152 mm) above the top of the chamber. Note that pavement subbase may be a part of this layer.</td>
<td>Granular well-graded soil/aggregate mixtures, &lt; 5% fines. Most pavement subbase materials can be used in lieu of this layer.</td>
<td>3, 387, 4, 467, 5, 56, 57, 5, 67, 68, 7, 76, 8, 85, 8, 10</td>
<td>Begin compaction after 24&quot; (610 mm) of material over the chambers is reached. Compact additional layers in 12&quot; (305 mm) max lifts to a min. 95% standard proctor density.</td>
</tr>
<tr>
<td><strong>B</strong> Embedment stone surrounding the chambers from the foundation stone to the 'D' layer above.</td>
<td>Clean, crushed, angular stone, nominal size distribution between 3/4 - 2 inch [19 - 61 mm]</td>
<td>3, 4</td>
<td>No compaction required.</td>
</tr>
<tr>
<td><strong>A</strong> Foundation stone below chambers from the subgrade up to the foot (bottom) of the chamber.</td>
<td>Clean, crushed, angular stone, nominal size distribution between 3/4 - 2 inch [19 - 61 mm]</td>
<td>3, 4</td>
<td>Plate compact or roll to achieve a 95% standard proctor density.</td>
</tr>
</tbody>
</table>

**PLEASE NOTE:**
1. The listed AASHTO designations are for gradations only. The stone must also be clean, crushed, angular. For example, a specification for 3" stone would state: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".

2. As an alternative to Proctor testing and field density measurements on open graded stone, StormTech compaction requirements are met for 'A' location materials when placed and compacted in 9" (229 mm) (max) lifts using two full coverages with an appropriate compactor.

---

**AVS ADVANCED SCAVENGE SYSTEMS, INC.**

**StormTech**

**Scale:** NT3

**Date:** 12-29-10

**Drawn By:** JM

**Checked:** KAM

---

The design engineer shall review this drawing prior to construction. It is the responsibility of the design engineer to review that the products specified meet all applicable laws, regulations, and project requirements.
COVER PIPE CONNECTION TO END CAP WITH ADS 601 NON-WOVEN GEOTEXTILE (OR EQUAL)

MC-4500 END CAP

CATCH BASIN OR MANHOLE

SUMP DEPTH TBD BY DESIGN ENGINEER

24" (600 mm) HDPE ACCESS PIPE REQUIRED. USE FACTORY PRE-CORED END CAPS.

2 LAYERS OF ADS 315WTM WOVEN GEOTEXTILE BETWEEN FOUNDATION STONE AND CHAMBERS. 10.3' (3.1 m) MIN. WIDE STRIPS

MC-4500 ISOLATOR ROW PROFILE

SCALE: NTS
DATE: 12-29-10
DRAWN BY: JM
CHECKED: KAM
CHAMBERS SHALL MEET ASTM F2418 "STANDARD SPECIFICATION FOR POLYPROPYENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS.

NOMINAL 3/4" - 2" (19 mm - 51 mm) CLEAN, CRUSHED, ANGULAR STONE (AASHTO M43 #3 & #4 STONE SIZES ALLOWED)

ADS 601 NON-WOVEN GEOTEXTILE (OR EQUAL) ALL AROUND CLEAN, CRUSHED, ANGULAR STONE

CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS.*

GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <5% FINES, COMPACT IN 12" (305 mm) MAX LIFTS TO 65% STANDARD PROCTOR DENSITY. SEE THE TABLE OF ACCEPTABLE FILL MATERIALS.

PAVEMENT DESIGN (PER ENGINEER'S DRAWINGS)

POSITION OF PLACEMENT FOR UNPAVED INSTALLATIONS WHERE COVER FROM HEAVY VEHICLES MAY OCCUR, INCREASE COVER TO 60" (1524 mm) MIN.

12" (305 mm) MIN

60" (1524 mm)

DEPTH OF STONE TO BE DETERMINED BY DESIGN ENGINEER 9" (229 mm) MIN

MC-4500 TYP CROSS SECTION

DESIGN ENGINEER IS RESPONSIBLE FOR ENSURING THE REQUIRED BEARING CAPACITY OF SUBGRADE SOILS

THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCE.
1. Inspection ports may be connected through any of (2) chamber corrugation valleys containing a stiffening rib.

2. All Schedule 40 fittings to be solvent cemented.

NYLOPLAST 12" [300 mm] inline drain body w/ 12" [300 mm] solid hinged cover and frame (see NYLOPLAST DWG# 7003-110-044 for paved applications / see DWG# 7003-110-045 for unpaved applications)

MC-4500 chamber

Nominal 3/4 - 2 inch [19 mm - 51 mm] clean crushed angular stone

4" [100 mm] sched 40 screw-in cap

Concrete collar

Pavement

Granular well graded soil / aggregate mixtures

4" [100 mm] sched 40 PVC

4" [100 mm] sched 40 PVC coupling

8" [203 mm]

4" [100 mm] sched 40 PVC

Core 4.5" [114 mm] Ø hole in chamber (4.5" [114 mm] hole saw req'd)

Any of (2) valley locations containing stiffening ribs

CONNECTION DETAIL

NTS

MC-4500 INSPECTION PORT DETAIL

SCALE: NTS
DATE: 6/15/11
DRAWN BY: KLJ
CHECKED: KAM
OPERATION, INSPECTION AND MAINTENANCE PROCEDURES

OPERATION

The Isolator Row is a row of StormTech chambers that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers allow storm water to flow vertically out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber.

The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.
If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

**MAINTENANCE**

The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.

**Step 1** Inspect Isolator Row for sediment  
A) Inspection ports (if present)
   i. Remove lid from floor box frame  
   ii. Remove cap from inspection riser  
   iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.  
   iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows  
   i. Remove cover from manhole at upstream end of Isolator Row  
   ii. Using a flashlight, inspect down Isolator Row through outlet pipe
      1. Mirrors on poles or cameras may be used to avoid a confined space entry  
      2. Follow OSHA regulations for confined space entry if entering manhole  
   iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2.
Step 2) Clean out Isolator Row using the JetVac process
   A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
   B) Apply multiple passes of JetVac until backflush water is clean
   C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect and clean catch basins and manholes upstream of the StormTech system

### SAMPLE MAINTENANCE LOG

<table>
<thead>
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<th>DATE</th>
<th>STADIA ROD READINGS</th>
<th>OBSERVATION/ACTIONS</th>
<th>INSPECTOR</th>
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<td>FIXED POINT TO TOP OF SEDIMENT(2)</td>
<td>SEDIMENT DEPTH (1)-(2)</td>
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<td></td>
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</table>
Soil Report
Preliminary Geotechnical Report
Infiltration Evaluation Report
Infiltration Evaluation Addendum
August 27, 2013
Project No. 0904-CR3

D•R•Horton Los Angeles Holding Company, Inc.
2280 Wardlow Circle, Suite 100
Corona, California 92880

Attention: Mr. Patrick Potts

Subject: Addendum to Infiltration Evaluation
Serrano I Project
City of Claremont, Los Angeles County, California

Reference: GeoTek, Inc., 2013, “Infiltration Evaluation, Serrano I Project, City of
Claremont, Los Angeles County, California,” Project No. 0904-CR3, dated
August 13.

Dear Mr. Potts:

As requested and authorized, GeoTek, Inc. (GeoTek) has prepared this addendum to the
referenced report documenting our evaluation of near-surface water infiltration potential
in the vicinity of the proposed infiltration area at the project site.

The project site is located southeasterly of the intersection of N. Mountain Avenue and W.
Baseline Road in the City of Claremont, Los Angeles County, California.

The reported infiltration rate of 14.1 inches per hour was measured for the test hole at a
depth of approximately one (1) foot below existing grade in the central portion of the site, or
the area identified by the project civil engineer as being the area to be used for infiltration
purposes. The currently proposed depth to the bottom of the designed infiltration chambers
ranges between approximately 10 and 12 feet below existing grade. Based on our experience
in the area and the relatively uniform nature of the alluvial soils across the project site, it is our
opinion that the previously reported infiltration rate of 14.1 inches per hour is considered
suitable for use at the location and depth of the currently proposed infiltration device. It
should be noted, however, that over the lifetime of the disposal area, the infiltration rates may
be affected by silt build up and biological activities, as well as local variations in near surface soil
conditions.
LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,

GeoTek, Inc.

[Signature]
Edward H. LaMont
CEG 1892, Exp. 07/31/14
Principal Geologist

Distribution: (1) Addressee via email

C:\Projects\0901 to 0950\0904CR3 DR Horton Claremont\Infiltration Evaluation\0904CR3 Infiltration Evaluation
Addendum.doc
D•R•Horton Los Angeles Holding Company, Inc.
2280 Wardlow Circle, Suite 100
Corona, California 92880

Attention: Mr. Patrick Potts

Subject: Infiltration Evaluation
Serrano I Project
City of Claremont, Los Angeles County, California

Dear Mr. Potts:

As requested and authorized, GeoTek, Inc. (GeoTek) has performed an evaluation of near-surface water infiltration potential in the vicinity of the proposed infiltration area at the project site.

The project site is located southeasterly of the intersection of N. Mountain Avenue and W. Baseline Road in the City of Claremont, Los Angeles County, California.

One (1) excavation was dug by hand, each to a depth of about one (1) foot below existing grade in the site area identified by the project civil engineer as being the area to be used for infiltration purposes (see Figure 1). Infiltration testing was completed using a double ring infiltrometer device in the excavation. A representative from our firm conducted the actual infiltration testing.

The slowest/most conservative infiltration rate of 14.1 inches per hour was measured for the test hole, after the infiltration rate had generally stabilized. The diameter of the inside ring of the infiltrometer was approximately twelve (12) inches. The testing was completed in general conformance with ASTM D 3385. Over the lifetime of the disposal area, the infiltration rates may be affected by silt build up and biological activities, as well as local variations in near surface soil conditions.
LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Our conclusions and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,

GeoTek, Inc.

Edward H. LaMont
CEG 1892, Exp. 07/31/14
Principal Geologist

Attachments: Figure 1 – Infiltration Test Locations
Infiltration Test Data

Distribution: (1) Addressee via email

G:\Projects\0901 to 0950\0904 CR3 DR Horton Claremont\Infiltration Study\0904 CR3 Infiltration Study.doc
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<th>RING FLOW (water added in ml)</th>
<th>ANNULAR READING (in)</th>
<th>SPACE FLOW (water added in ml)</th>
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<th>INNER (in/hr)</th>
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### DOUBLE RING INFILTROMETER TEST DATA

| Project Name and Test Location: D.R. Horton - Claremont Surveys | Liquid Used: Water |
| Trench No.: S-1 | Equipment: N/A |
| Tested by: DWS | Field Measurements |
| Date of Testing: 9/9/201 | Penetration of Rings Into Soil: |
| Inner Ring Diameter (in.): 32 | Inner Ring - 4 in; Outer Ring - 6 in. |
| Water Table Depth (ft.): >50 | Outer Ring Diameter (in.): 24 |

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## DOUBLE RING INFILTROMETER TEST DATA

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**Trench No.:** L1  
**Tested by:** DVS  
**Date of Testing:** 09/20/13  
**Inner Ring Diameter (in.):** 12  
**Water Table Depth (ft.):** >50  
**Liquid Used:** Water  
**Equipment:** N/A  
**Liquid Level Maintained by Using:** Hand Measurements  
**Penetration of Rings Into Soil:** Inner Ring - 4 in; Outer Ring - 6 in;  
**Outer Ring Diameter (in.):** 24  
**USCS Classification:**

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Preliminary Geotechnical Evaluation
For
Proposed Residential Development
Baseline Grove Project
Claremont, Los Angeles County, California

Prepared for
D.R. Horton Los Angeles Holding Company, Inc.
2280 Wardlow Circle, Suite 100
Corona, California 92880

Prepared by
GeoTek, Inc.
710 E. Parkridge Avenue, Suite 105
Corona, California 92879

Project No. 0904-CR3

September 28, 2012
D.R. Horton Los Angeles Holding Company, Inc.
2280 Wardlow Circle, Suite 100
Corona, California 92880

Attention: Mr. Dan Boyd

Subject: Preliminary Geotechnical Evaluation
Baseline Grove Project, SE of W. Baseline Road and N. Mountain Avenue
Claremont, Los Angeles County, California

Dear Mr. Boyd:

We are pleased to provide herein the results of our preliminary geotechnical evaluation for the subject property located in the City of Claremont, County of Los Angeles, California. This report presents a discussion of our evaluation and provides preliminary geotechnical recommendations for earthwork, foundation design, and construction. In our opinion, site development appears feasible from a geotechnical viewpoint provided that the recommendations included herein are incorporated into the design and construction phases of site development.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to call our office.

Respectfully submitted,
GeoTek, Inc.

Edward H. LaMont
CEG 1892, Exp. 07/31/14
Principal Geologist

Distribution: (5) Addressee

GeoProjects0901 to 0950.0904CR3 DR Horton Claremont0904CR3 Preliminary Geotechnical Evaluation.doc
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**ENCLOSURES**

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- **Figure 3** – Trench Location Map

- **Appendix A** – Trench Logs
- **Appendix B** – Laboratory Test Results
- **Appendix C** – General Grading Guidelines
1. PURPOSE AND SCOPE OF SERVICES

The purpose of this study was to evaluate the geotechnical conditions in the area of proposed construction. Services provided for this study included the following:

- Research and review of available geologic data and general information pertinent to the site,
- Site reconnaissance,
- Excavation of six exploratory test trenches onsite,
- Collection of bulk soil samples of the onsite materials,
- Laboratory testing of the soil samples collected from the site,
- Review and evaluation of site seismicity, and
- Compilation of this geotechnical report which presents our recommendations for site development.

2. SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 SITE DESCRIPTION

The Baseline Grove project is located southeasterly of the intersection of N. Mountain Avenue and W. Baseline Road in the City of Claremont, Los Angeles County, California (see Figure 1). The rectangular shaped property is comprised of roughly 4.21 acres of land. Topography across the site slopes gently down toward the southwest, with a total relief on the order of roughly 20 feet (see Figure 2).

Mixed-use properties immediately surround the subject site including a Claremont Unified School District facility adjacent to the east, Interstate 210 Freeway to the south, and commercial and residential properties to the north and west of W. Baseline Road and N. Mountain Avenue, respectively, toward the northern and western edges of the site.
The subject property is currently occupied by a couple of apparently vacant buildings (see Figure 3), with perimeter parking lot areas (paved and unpaved). An existing block wall, which may be retaining a small amount of material on the north side, is located adjacent the south side of the property. This wall is understood to have been constructed as part of Interstate 210 improvements, and is owned by Caltrans.

2.2 PROPOSED DEVELOPMENT

It is our understanding that proposed site improvements include razing all of the existing site improvements, and constructing 55 new detached single-family residences. No grading plans or specific information has yet been provided for the proposed improvements, other than a conceptual site plan indicating that the new residences will likely be two-story structures, with no basements or below-ground parking. It is assumed that the new structures will utilize wood-frames and conventional foundation systems with slab-on-grade construction. Associated small retaining walls (six feet high or less), driveways, flatwork and landscaping is also anticipated. Structural loads are anticipated to be typical for this type of construction.

If site development differs from the assumptions made herein, the recommendations included in this report should be subject to further review and evaluation. Site development plans should be reviewed by GeoTek when they become available.

3. FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION

Field exploration was conducted on September 12, 2012. An engineering geologist from GeoTek logged six (6) exploratory test trenches, excavated by a backhoe. The trenches were located at various locations across the site (see Trench Location Map, Figure 3). The approximate depths of the trenches were up to six (6) feet. Logs of the trenches are included in Appendix A. GeoTek collected samples of onsite soil materials encountered in the excavations.

3.2 LABORATORY TESTING

Laboratory testing was performed on a bulk soil sample collected during the field exploration. The purpose of the laboratory testing was to confirm the field classification of the soil
materials encountered and to evaluate the soils physical properties for use in the engineering design and analysis. Results of the laboratory testing program along with a brief description and relevant information regarding testing procedures are included in Appendix B.

4. GEOLOGIC AND SOILS CONDITIONS

4.1 REGIONAL SETTING

The subject property is situated toward the southern edge of the Transverse Ranges geomorphic province. The Transverse Ranges are an east-west trending series of steep mountain ranges and valleys. The east-west structure of the Transverse Ranges is unique to the normal northwest trend of the adjacent provinces, most closely reflected by the Peninsular Ranges to the south. The Transverse Ranges province extends offshore to the west (San Miguel, Santa Rosa, and Santa Cruz islands), and the San Bernardino Mountains to the east. The San Andreas Fault has displaced the San Bernardino Mountains toward the eastern portion of the province. Intense north-south compression is squeezing the Transverse Ranges. As a result, this province is rapidly rising.

No active faults are known to exist in the immediate vicinity of the subject site. The nearest known active fault to the site is the Cucamonga, located several kilometers to the north.

4.2 GENERAL SOIL/GEOLOGIC CONDITIONS

A brief description of the earth materials encountered below the subject lot is presented in the following section. Based on our field exploration and observations, the site is mostly underlain by a relatively thin layer of undocumented fill soils. Thicker fill zones are possible.

4.2.1 Fill Soils

Based on our field exploration and site observations, undocumented fill materials underlie the portions of the property. These materials were generally observed to consist of gravelly, cobbly silty sand (see logs in Appendix A). The undocumented fill materials encountered were loose to medium dense and slightly moist to moist with depth. Maximum depth of the fill encountered in our test trenches was roughly three (3) feet (see Appendix A, Trench T-5), with deeper zones likely. Undocumented fill is likely deepest toward the northwest portion of the site (landscape area), possibly beneath the existing large site building, and toward the access driveway from W. Baseline Road located toward the northeast side of the site. For
most of the site, the existing fill appears to be surficial in nature, and likely on the order of a foot or so deep.

4.2.2 Alluvium

Quaternary-age older alluvium (fan deposits) was encountered in all of the trenches excavated on the site, beneath the undocumented fill described above. In general, the alluvial materials typically consist of silty cobble sands and gravelly cobble sands with some small boulders. According to the results of the laboratory testing performed, the sample of alluvium material tested indicated a "very low" expansion potential ($E_I = 0$) when tested and classified in accordance with ASTM D 4829. The test results are shown in Appendix B.

4.3 SURFACE AND GROUNDWATER

4.3.1 Surface Water

If encountered during the earthwork construction, surface water on this site is the result of precipitation or surface run-off from surrounding sites. Overall surface drainage in the area is variable, and most commonly directed toward the nearest street or alley. Provisions for surface drainage will need to be accounted for by the project civil engineer, if necessary.

4.3.2 Groundwater

Groundwater was not encountered in our exploratory excavations. Based on GeoTek's experience in the area, and other geotechnical reports reviewed for the area, groundwater depth in the immediate site vicinity is greater than 100 feet. However, groundwater or localized seepage can occur due to variations in rainfall, irrigation practices, and other factors not evident at the time of this investigation.

4.4 FAULTING AND SEISMICITY

The geologic structure of the entire southern California area is dominated mainly by northwest-trending faults associated with the San Andreas system. The site is in a seismically active region. No active or potentially active fault is known to exist at this site nor is the site situated within an "Alquist-Priolo" Earthquake Fault Zone. The subject lot is not located within a State of California Seismic Hazard Zone (area not yet mapped).

4.4.1 Seismic Design Parameters

The site is located at approximately 34.1211 Latitude and -117.7279 Longitude. Site spectral accelerations ($S_a$ and $S_I$), for 0.2 and 1.0 second periods for a Class "D" site, was determined
from the USGS Website, Earthquake Hazards Program, Interpolated Probabilistic Ground Motion for the Conterminous 48 States by Latitude/Longitude, 2009 Data. The results are presented in the following table:

<table>
<thead>
<tr>
<th>SITE SEISMIC PARAMETERS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mapped 0.2 sec Period Spectral Acceleration, ( S_a )</td>
<td>2.645g</td>
</tr>
<tr>
<td>Mapped 1.0 sec Period Spectral Acceleration, ( S_1 )</td>
<td>1.022g</td>
</tr>
<tr>
<td>Site Coefficient for Site Class &quot;D&quot;, ( F_a )</td>
<td>1.0</td>
</tr>
<tr>
<td>Site Coefficient for Site Class &quot;D&quot;, ( F_v )</td>
<td>1.5</td>
</tr>
<tr>
<td>Maximum Considered Earthquake Spectral Response Acceleration for 0.2 Second, ( S_{2s} )</td>
<td>2.645g</td>
</tr>
<tr>
<td>Maximum Considered Earthquake Spectral Response Acceleration for 1.0 Second, ( S_{10} )</td>
<td>1.533g</td>
</tr>
<tr>
<td>5% Damped Design Spectral Response Acceleration Parameter at 0.2 Second, ( S_{0.2} )</td>
<td>1.763g</td>
</tr>
<tr>
<td>5% Damped Design Spectral Response Acceleration Parameter at 1 second, ( S_{1} )</td>
<td>1.022g</td>
</tr>
</tbody>
</table>

4.5 LIQUEFACTION AND SEISMICALLY INDUCED SETTLEMENT

Liquefaction describes a phenomenon in which cyclic stresses, produced by earthquake-induced ground motion, create excess pore pressures in relatively cohesionless soils. These soils may thereby acquire a high degree of mobility, which can lead to lateral movement, sliding, consolidation and settlement of loose sediments, sand boils and other damaging deformations. This phenomenon occurs only below the water table, but after liquefaction occurs, the liquefied soil/water matrix can propagate upward into overlying non-saturated soil as excess pore water dissipates.

The factors known to influence liquefaction potential include soil type and grain size, relative density, groundwater level, confining pressures, and both intensity and duration of ground shaking. In general, materials that are susceptible to liquefaction are loose, saturated granular soils having low fines content under low confining pressures.

The liquefaction potential on the site is considered negligible due to the nature of the underlying materials (relatively dense older alluvium) and lack of a shallow groundwater table.
4.6 OTHER SEISMIC HAZARDS

Evidence of ancient landslides or slope instabilities at this site was not observed during our investigation. Thus, the potential for landslides is considered negligible.

The potential for secondary seismic hazards such as a seiche or tsunami is considered negligible due to site elevation and distance to an open body of water.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1 GENERAL

Anticipated site development appears feasible from a geotechnical viewpoint provided that the following recommendations are incorporated into the design and construction phases of development. Site development and grading plans should be reviewed by GeoTek when they become available. Cuts and fills on the order of up to five (5) are anticipated for the subject development.

5.2 EARTHWORK CONSIDERATIONS

Earthwork and grading should be performed in accordance with the applicable grading ordinances of the City of Claremont, the 2010 California Building Code (CBC), and recommendations contained in this report. The Grading Guidelines included in Appendix C outline general procedures and do not anticipate all site-specific situations. In the event of conflict, the recommendations presented in the text of this report should supersede those contained in Appendix C.

5.2.1 Site Clearing and Demolition

In areas of planned grading or improvements, the site should be cleared of existing improvements, vegetation, roots, trash and debris, and properly disposed of offsite. Yields resulting from razing the existing site structures and improvements should be replaced with engineered fill materials with expansion characteristics similar to the onsite materials.
5.2.3 Removals/Overexcavations

If not removed by the proposed grading, all artificial (undocumented) fill materials and the upper one (1) to three (3) feet of alluvium are relatively loose and dry and are subject to complete removal and recompaction within the limits of grading. Depending on actual field conditions encountered during grading, locally deeper areas of removal may be required. The bottom of all remedial excavations should be scarified to a minimum depth of eight (8) inches, brought to at least optimum moisture content and then recompacted to minimum project standards.

5.2.2 Fills

The onsite soils are considered suitable for reuse as engineered fill provided they are free from vegetation, debris and other deleterious material. The undercut areas should be brought to final subgrade elevations with fill materials that are placed and compacted in general accordance with minimum project standards. Fill materials should be placed at or above optimum moisture content and should be compacted to a minimum relative compaction of 90% as determined by ASTM Test Method D 1557.

Rocks or rock fills that may be generated from the materials excavated onsite should be placed in accordance with the procedures presented in Appendix C (see Pages C-6 through C-8, Limited Larger Rock & Structural Rock Fills). Additionally, rock fragments or cobbles less than six (6) inches in diameter may be utilized in the fill, provided they are not placed in concentrated pockets; there is a sufficient percentage of fine-grained material (i.e., silts and sands) to surround the rocks; and, the distribution of the rocks in the overall fill is observed by and acceptable to our field representative.

Rocks greater than six (6) inches in diameter should not be placed within three (3) feet of finish grades, and should be placed in accordance with the procedures presented in Appendix C. Large rock should also not be placed where utility trenching is anticipated.

5.2.4 Cut and Transition Lots

All cut lots and cut portions of transition lots should be overexcavated a minimum of three (3) feet below finish pad grade or a minimum of two (2) feet below the bottom of the deepest proposed footing, whichever is deeper. Prior to replacing the overexcavated area with very low expansive compacted fill, the exposed removal bottom should be scarified to a minimum depth of eight (8) inches, brought to at least optimum moisture content and then recompacted to minimum project standards. Overexcavations should extend five (5) feet outside the
proposed building envelope(s). Overexcavations are recommended to provide a more uniform fill cap and decrease the potential for future differential settlement.

5.2.5 Excavation Characteristics

Excavation in the onsite soil materials is expected to be easy using heavy-duty grading equipment in good operating conditions. All temporary excavations for grading purposes and installation of underground utilities should be constructed in accordance with local and Cal-OSHA guidelines. Temporary excavations within the onsite materials should be stable at 1:1 (H:V) inclinations for cuts less than 5 feet in height.

5.2.6 Shrinkage and Subsidence

Several factors will impact earthwork balancing on the site, including shrinkage, bulking, subsidence, trench spoil from utilities and footing excavations, as well as the accuracy of topography.

Shrinkage, bulking and subsidence are primarily dependent upon the degree of compactive effort achieved during construction. For planning purposes, a shrinkage factor of 0 to 10 percent may be considered for the materials requiring removal and/or recompaction. Site balance areas should be available in order to adjust project grades, depending on actual field conditions at the conclusion of site earthwork construction. Subsidence and bulking are not considered to be factors with the underlying materials within the vicinity of the proposed construction.

5.3 DESIGN RECOMMENDATIONS

5.3.1 Foundation Design Criteria

Foundation design criteria for a conventional foundation system, in general conformance with the 2010 CBC, are presented herein. Based on the expansion index laboratory test result, the onsite soils near subgrade may be classified as "very low" expansive soils (0≤EI<20). Below is typical design criteria for the area based on "very low" expansion potential. These minimal recommendations and are not intended to supersede the design by the structural engineer.

The foundation elements for the proposed structures and other improvements should be founded entirely in engineered fill soils.

A summary of our foundation design recommendations is presented below:
MINIMUM DESIGN REQUIREMENTS

<table>
<thead>
<tr>
<th>DESIGN PARAMETER</th>
<th>(0 \leq EI \leq 20)</th>
</tr>
</thead>
</table>
| Foundation Depth or Minimum Perimeter Beam Depth (inches below lowest adjacent grade) | One-Story – 12  
Two-Story – 18 |
| Minimum Foundation Width (Inches) | 12 |
| Minimum Slab Thickness (inches) | 4 |
| Minimum Slab Reinforcing | 18" on-center, each way, placed in the middle \(1/3\) of the slab  
No. 3 rebar |
| Minimum Footing Reinforcement | Two (2) No. 4 Reinforcing Bars  
One (1) top and One (1) bottom |
| Presaturation of Subgrade Soil (Percent of Optimum/Depth in Inches) | 100% to a depth of 12 inches |

It should be noted that the above recommendations are based on soil support characteristics only. The structural engineer should design the slab and beam reinforcement based on actual loading conditions.

The following criteria for design of foundations should be implemented into design:

5.3.1.1 An allowable bearing capacity of 1500 pounds per square foot (psf) may be used for design of continuous and perimeter footings 12 inches deep and 12 inches wide, and pad footings 24 inches square and 12 inches deep. This value may be increased by 300 pounds per square foot for each additional 12 inches in depth and 150 pounds per square foot for each additional 12 inches in width to a maximum value of 2500 psf.

The passive earth pressure may be computed as an equivalent fluid having a density of 350 psf per foot of depth, to a maximum earth pressure of 2500 psf for footings founded on engineered fill soils. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. The upper one (1) foot of soil below the adjacent grade should not be used in calculating passive pressure. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

The above values may be increased as allowed by Code to resist short-term transient loads (e.g. seismic and wind loads).

5.3.1.2 Based on our experience in the area, structural foundations may be designed to withstand a total static settlement of 1 inch and a corresponding maximum
differential settlement of one-half of the total settlement over a horizontal distance of 30 feet.

The foundation engineer should incorporate these settlement estimates from the structural loads into the design of the slab, as appropriate.

5.3.1.3 A grade beam, 12 inches wide, should be utilized across large opening or garage entrances. The base of the grade beam should be at the same elevation as the bottom of the adjoining footings (minimum 12 inches in depth).

5.3.1.4 A moisture and vapor retarding system should be placed below slabs-on-grade where moisture migration through the slab is undesirable. Guidelines for these are provided in the 2010 California Green Building Standards Code (CALGreen) Section 4.505.2 and the 2010 CBC Section 1910.1.

It should be realized that the effectiveness of the vapor retarding membrane can be adversely impacted as a result of construction related punctures (e.g. stake penetrations, tears, punctures from walking on the aggregate layer, etc.). These occurrences should be limited as much as possible during construction. Thicker membranes are generally more resistant to accidental puncture than thinner ones. Products specifically designed for use as moisture/vapor retarders may also be more puncture resistant. Although the CBC specifies a 6 mil vapor retarder membrane, it is GeoTek’s opinion that a minimum 10 mil thick membrane with joints properly overlapped and sealed should be considered, unless otherwise specified by the slab design professional.

Moisture and vapor retarding systems are intended to provide a certain level of resistance to vapor and moisture transmission through the concrete, but do not eliminate it. The acceptable level of moisture transmission through the slab is to a large extent based on the type of flooring used and environmental conditions. Ultimately, the vapor retarding system should be comprised of suitable elements to limit migration of water and reduce transmission of water vapor through the slab to acceptable levels. The selected elements should have suitable properties (i.e., thickness, composition, strength, and permeance) to achieve the desired performance level. Consideration should be given to consulting with an individual possessing specific expertise in this area for additional evaluation.
5.3.2 Miscellaneous Foundation Recommendations

- Isolated exterior footings should be tied back to the main foundation system in two (2) orthogonal directions.

- To reduce moisture penetration beneath the slab on grade areas, utility trenches should be backfilled with engineered fill, lean concrete or concrete slurry where they intercept the perimeter footing or thickened slab edge.

- Soils from the footing excavations should not be placed in the slab-on-grade areas unless properly compacted and tested. The excavations should be free of loose/sloughed materials and be neatly trimmed at the time of concrete placement.

- Under-slab utility trenches should be compacted to project specifications. Compaction should be achieved with a mechanical compaction device. If backfill soils have dried out, they should be thoroughly moisture conditioned prior to placement in trenches.

- Utility trench excavations should be shored or laid back in accordance with applicable CAL/OSHA standards.

- On-site materials may not be suitable for use as bedding material, but will be suitable as backfill provided oversized materials are removed. Jetting of native soils will not be acceptable.

5.3.3 Foundation Set Backs

Minimum setbacks to all foundations should comply with the 2010 CBC or City of Claremont requirements, whichever is greater. Improvements not conforming to these setbacks are subject to the increased likelihood of excessive lateral movements and/or differential settlements. If large enough, these movements can compromise the integrity of the improvements. The following recommendations are presented:

- The outside bottom edge of all footings should be set back a minimum of H/3 (where H is the slope height) from the face of any descending slope. The setback should be at least seven (7) feet and need not exceed 40 feet.

- The bottom of all footings for structures near retaining walls should be deepened so as to extend below a 1:1 projection upward from the bottom inside edge of the wall stem.

- The bottom of any existing foundations for structures should be deepened so as to extend below a 1:1 projection upward from the bottom of the nearest excavation.
5.3.4 Retaining and Garden Wall Design and Construction

General Design Criteria

Recommendations presented herein apply to typical masonry or concrete vertical retaining walls to a maximum height of up to 10 feet. Additional review and recommendations should be requested for higher walls. These are typical design criteria and are not intended to supersede the design by the structural engineer.

Retaining wall foundations embedded a minimum of 18 inches into engineered fill should be designed using an allowable bearing capacity of 1800 psf. This value may be increased by 300 pounds per square foot for each additional 12 inches in depth and 150 pounds per square foot for each additional 12 inches in width to a maximum value of 2500 psf.

The passive earth pressure may be computed as an equivalent fluid having a density of 350 psf per foot of depth, to a maximum earth pressure of 2500 psf. A coefficient of friction between soil and concrete of 0.35 may be used with dead load forces. The upper one (1) foot of soil below the adjacent grade should not be used in calculating passive pressure.

The above values may be increased as allowed by Code to resist short-term transient loads (e.g. seismic and wind loads).

Continuous footings should have a minimum reinforcement consisting of two (2) No. 4 reinforcing bars, one (1) top and one (1) bottom. Structural needs may govern and should be evaluated by the structural engineer.

Cantilevered Walls

The recommendations presented below are for cantilevered retaining walls up to 10 feet high. Active earth pressure may be used for retaining wall design, provided the top of the wall is not restrained from minor deflections. An equivalent fluid pressure approach may be used to compute the horizontal pressure against the wall. Appropriate fluid unit weights are given below for specific slope gradients of the retained material. These do not include other superimposed loading conditions such as traffic, structures, seismic events, or adverse geologic conditions.
<table>
<thead>
<tr>
<th>Active Earth Pressures</th>
<th>Surface Slope of Retained Materials (1:3)</th>
<th>Equivalent Fluid Pressure (psf) Select Backfill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2:1</td>
<td>36</td>
<td>55</td>
</tr>
</tbody>
</table>

* The design pressures assume the backfill materials have an EI ≤ 20 and an SE > 30. Backfill zone includes area between back of wall to plane (1:1, h,v) up from back of wall foundation to ground surface.

Additional lateral forces can be induced on retaining walls during an earthquake. For level backfill and a Site Class "D", the minimum earthquake-induced force (F₀) should be 10H² (lbs/linear foot of wall). This force can be assumed to act at a distance of 0.6H above the base of the wall, where “H” is the height of the retaining wall measured from the base of the footing (in feet).

**Retaining Wall Backfill and Drainage**

Retaining wall backfill should be materials comprised of materials with EI ≤ 20 and an SE > 30. The wall backfill should also include a minimum one (1) foot wide section of 3/4 to 1-inch clean crushed rock (or approved equivalent). The rock should be placed immediately adjacent to the back of wall and extend up from the back drain to within approximately 12 inches of finish grade. The upper 12 inches should consist of compacted onsite materials. Presence of other materials might necessitate revision to the parameters provided and modification of wall designs. The backfill materials should be placed in lifts no greater than eight (8)-inches in thickness and compacted to a minimum of 90% relative compaction in accordance with ASTM Test Method D 1557. Proper surface drainage needs to be provided and maintained.

Retaining walls should be provided with an adequate pipe and gravel back drain system to prevent build up of hydrostatic pressures. Backdrains should consist of a four (4)-inch diameter perforated collector pipe (Schedule 40, SDR 35, or approved equivalent) embedded in a minimum of one (1) cubic foot per lineal foot of ¾- to 1-inch clean crushed rock or equivalent, wrapped in filter fabric (Mirafl 140N or approved equivalent). The drain system should be connected to a suitable outlet. A minimum of two (2) outlets should be provided for each drain section. Spacing between drain outlets should not exceed 50 feet. Waterproofing of site walls should be performed where moisture migration through the wall is undesirable.
Walls from two (2) to four (4) feet in height may be drained using localized gravel packs behind weep holes at 10 feet maximum spacing (e.g. approximately 1.5 cubic feet of gravel in a woven plastic bag). Weep holes should be provided or the head joints omitted in the first course of block extended above the ground surface. However, nuisance water may still collect in front of the wall.

Restrained Retaining Walls

Retaining walls that will be restrained prior to placing and compacting backfill material or that have reentrant or male corners, should be designed for an at-rest equivalent fluid pressure of 65 psf, plus any applicable surcharge loading. For areas of male or reentrant corners, the restrained wall design should extend a minimum distance of twice the height of the wall laterally from the corner, or a distance otherwise determined by the structural engineer.

Other Design Considerations

- Retaining and garden wall foundation elements should be designed in accordance with building code setback requirements. A minimum horizontal setback distance of seven (7) feet as measured from the bottom outside edge of the footing to slope face is recommended.
- Passive earth pressure coefficients used in the design of retaining and garden walls should consider descending slope conditions. Passive pressures should be reduced by one-half in the case of descending 2:1 (h:v) gradient slopes.
- Wall design should consider the additional surcharge loads from superjacent slopes and/or footings, where appropriate.
- No backfill should be placed against concrete until minimum design strengths are evidenced by compression tests of cylinders.
- The retaining wall footing excavations, backcuts, and backfill materials should by approved the project geotechnical engineer or their authorized representative.
- Positive separations should be provided in garden walls at distances not exceeding 20 horizontal feet.
5.3.5 Soil Corrosivity

The soil resistivity at this site was tested in the laboratory on a sample collected during the field exploration. The results of the testing indicate that the soil sample was considered "moderately corrosive" to buried ferrous metals in accordance with current standards commonly used by corrosion engineers. These characteristics are considered typical of soils commonly found in southern California. Consideration should be given to consulting with a corrosion engineer.

5.3.6 Soil Sulfate Content

The sulfate content was determined in the laboratory for a representative onsite soil sample. The results indicate that the water soluble sulfate range is less than 0.1 percent by weight, which is considered "not applicable" (i.e. negligible) as per Table 4.2.1 of ACI 318. Based upon the test results, no special concrete mix design is required by Code for sulfate attack resistance.

5.3.7 Import Soils

Import soils should have expansion characteristics similar to the onsite soils. GeoTek also recommends that, as a minimum, proposed import soils be tested for soluble sulfate content. GeoTek should be notified a minimum of 72 hours of potential import sources so that appropriate sampling and laboratory testing can be performed.

5.3.8 Concrete Flatwork

5.3.8.1 Exterior Concrete Slabs, Sidewalks and Driveways

Exterior concrete slabs, sidewalks and driveways should be designed using a four (4) inch minimum thickness. No specific reinforcement is required. However, some shrinkage and cracking of the concrete should be anticipated as a result of typical mix designs and curing practices commonly utilized in residential construction.

Sidewalks and driveways may be under the jurisdiction of the governing agency. If so, jurisdictional design and construction criteria would apply, if more restrictive than the recommendations presented herein.

Subgrade soils (typically "very low" expansion potential) should be pre-moistened prior to placing concrete. The subgrade soils below exterior slabs, sidewalks, driveways, etc. at the subject site should be pre-saturated to a minimum of 100% of optimum moisture content to a depth of 12 inches.
All concrete installation, including preparation and compaction of subgrade, should be done in accordance with the City of Claremont and/or County of Los Angeles specifications, and under the observation and testing of GeoTek and a City Inspector, if necessary.

5.3.8.2 Concrete Performance
Concrete cracks should be expected. These cracks can vary from sizes that are essentially unnoticeable to more than 1/8 inch in width. Most cracks in concrete, while unsightly, do not significantly impact long-term performance. While it is possible to take measures (proper concrete mix, placement, curing, control joints, etc.) to reduce the extent and size of cracks that occur, some cracking will occur despite the best efforts to minimize it. Concrete can also undergo chemical processes that are dependent on a wide range of variables, which are difficult, at best, to control. Concrete, while seemingly a stable material, is also subject to internal expansion and contraction due to external changes over time.

One of the simplest means to control cracking is to provide weakened control joints for cracking to occur along. These do not prevent cracks from developing; they simply provide a relief point for the stresses that develop. These joints are a widely accepted means to control cracks but are not always effective. Control joints are more effective the more closely spaced they are. GeoTek suggests that control joints be placed in two directions and located a distance apart roughly equal to 24 to 36 times the slab thickness.

Exterior concrete flatwork (patios, walkways, driveways, etc.) is often some of the most visible aspects of site development. They are typically given the least level of quality control, being considered "non-structural" components. We suggest that the same standards of care be applied to these features as to the structure itself.

5.4 POST CONSTRUCTION CONSIDERATIONS

5.4.1 Landscape Maintenance and Planting
Water has been shown to weaken the inherent strength of soil, and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Controlling surface drainage and runoff, and maintaining a suitable vegetation cover can minimize erosion. Plants selected for landscaping should be lightweight, deep-rooted types that require little water and are capable of surviving the prevailing climate.
Overwatering should be avoided. The soils should be maintained in a solid to semi-solid state as defined by the materials Atterberg Limits. Care should be taken when adding soil amendments to avoid excessive watering. Leaching as a method of soil preparation prior to planting is not recommended. An abatement program to control ground-burrowing rodents should be implemented and maintained. This is critical as burrowing rodents can decreased the long-term performance of slopes.

It is common for planting to be placed adjacent to structures in planter or lawn areas. This will result in the introduction of water into the ground adjacent to the foundation. This type of landscaping should be avoided. If used, then extreme care should be exercised with regard to the irrigation and drainage in these areas.

5.4.2 Drainage

The need to maintain proper surface drainage and subsurface systems cannot be overly emphasized. Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond or seep into the ground. Pad drainage should be directed toward approved area(s) and not be blocked by other improvements.

It is the owner's responsibility to maintain and clean drainage devices on or contiguous to their lot. In order to be effective, maintenance should be conducted on a regular and routine schedule and necessary corrections made prior to each rainy season.

5.5 PLAN REVIEW AND CONSTRUCTION OBSERVATIONS

We recommend that site grading, specifications, pool, and foundation plans be reviewed by this office prior to construction to check for conformance with the recommendations of this report. We also recommend that GeoTek representatives be present during site grading and foundation construction to check for proper implementation of the geotechnical recommendations. The owner/developer should verify that GeoTek representatives perform at least the following duties:

- Observe site clearing and grubbing operations for proper removal of unsuitable materials.
- Observe and test bottom of removals prior to fill placement.
- Evaluate the suitability of onsite and import materials for fill placement, and collect soil samples for laboratory testing where necessary.
- Observe the fill for uniformity during placement, including utility trenches. Also, perform field density testing of the fill materials.
• Observe and probe foundation excavations to confirm suitability of bearing materials.

If requested, a construction observation and compaction report can be provided by GeoTek, which can comply with the requirements of the governmental agencies having jurisdiction over the project. We recommend that these agencies be notified prior to commencement of construction so that necessary grading permits can be obtained.

6. INTENT

It is the intent of this report to aid in the design and construction of the proposed development. Implementation of the advice presented in Section 5 of this report is intended to reduce risk associated with construction projects. The professional opinions and geotechnical advice contained in this report are not intended to imply total performance of the project or guarantee that unusual or variable conditions will not be discovered during or after construction.

The scope of our evaluation is limited to the boundaries of the subject residential lot. This review does not and should in no way be construed to encompass any areas beyond the specific area of the proposed construction as indicated to us by the client. Further, no evaluation of any existing site improvements is included. The scope is based on our understanding of the project and the client’s needs, our fee estimate (P3-0402012) dated April 26, 2012 and geotechnical engineering standards normally used on similar projects in this region.

7. LIMITATIONS

The materials observed on the project site appear to be representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during site construction. Site conditions may vary due to seasonal changes or other factors. GeoTek, Inc. assumes no responsibility or liability for work, testing or recommendations performed or provided by others.

Since our recommendations are based on the site conditions observed and encountered, and laboratory testing, our conclusion and recommendations are professional opinions that are limited to the extent of the available data. Observations during construction are important to allow for any change in recommendations found to be warranted. These opinions have been
derived in accordance with current standards of practice and no warranty is expressed or implied. Standards of practice are subject to change with time.

8. SELECTED REFERENCES


California Department of Water Resources groundwater well data (http://wdl.water.ca.gov).


GeoTek, Inc., In-house proprietary information.

LEGEND

T-6
Approximate Location of Exploratory Trench

DR Horton Los Angeles Holding Company, Inc.
Baseline Grove
City of Claremont
County of Los Angeles, California

GeoTek Project No. 0904-CR3

Figure 3
Trench Location Map

GEOTEK
APPENDIX A

TRENCH LOGS

Baseline Grove Project
Claremont, Los Angeles County, California
Project No. 0904-CR3
A - FIELD TESTING AND SAMPLING PROCEDURES

The Standard Penetration Test (SPT)
The SPT is performed in accordance with ASTM Test Method D 1586. The SPT sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The split-barrel sampler has an external diameter of 2 inches and an unlined internal diameter of 1-3/8 inches. The samples of earth materials collected in the sampler are typically classified in the field, bagged, sealed and transported to the laboratory for further testing.

The Modified Split-Barrel Sampler (Ring)
The ring sampler is driven into the ground in accordance with ASTM Test Method D 3550. The sampler, with an external diameter of 3.0 inches, is lined with 1-inch long, thin brass rings with inside diameters of approximately 2.4 inches. The sampler is typically driven into the ground 12 or 18 inches with a 140-pound hammer free falling from a height of 30 inches. Blow counts are recorded for every 6 inches of penetration as indicated on the log of boring. The samples are removed from the sample barrel in the brass rings, sealed, and transported to the laboratory for testing.

Bulk Samples (Larger)
These samples are normally large bags of earth materials over 20 pounds in weight collected from the field by means of hand digging or exploratory cuttings.

Bulk Samples (Small)
These are plastic bag samples which are normally airtight and contain less than 5 pounds in weight of earth materials collected from the field by means of hand digging or exploratory cuttings. These samples are primarily used for determining natural moisture content and classification indices.

B - BORING LOG LEGEND
The following abbreviations and symbols often appear in the classification and description of soil and rock on the logs of borings:

SOILS
USCS Unified Soil Classification System
f-c Fine to coarse
f-m Fine to medium

GEOLOGIC
B: Attitudes Bedding; strike/dip
J: Attitudes Joint; strike/dip
C: Contact line

Dashed line denotes USCS material change
Solid Line denotes unit / formational change
Thick solid line denotes end of boring

(Additional denotations and symbols are provided on the log of borings)
**TRENCH NO.: T-1**

**MATERIAL DESCRIPTION AND COMMENTS**

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Samples</th>
<th>Sample Type</th>
<th>Soil Type</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>---</td>
<td></td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Undocumented Fill:**
- Si-ty cobbly gravelly SAND (SP), gray brown, damp to dry, loose

**Alluvium:**
- Ga-Vel (GP), yellow brown, dry to slightly moist, medium dense, ~60 to 70% well rounded clasts up to 10” in diameter with most 1 to 4” in diameter

@4’, becomes moist with some larger clasts

**TRENCH TERMINATED AT 6 FEET**

- No Groundwater Encountered
- No Caving
- Backfilled with Trench Spoils

**LEGEND**

- **Sample Types:**
  - Ring Sample
  - Large Bulk Sample
  - Water Table

- **Laboratory Testing:**
  - AL = Atterberg Limits
  - EI = Expansion Index
  - MD = Maximum Density
  - SA = Sieve Analysis
  - SR = Sulfate/Resistivity Test
  - SV = Shear Testing
  - RV = R-Value Test
  - CO = Consolidation
GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0994-CR3
PROJECT NAME: Baseline Grove
CLIENT: D.R. Horton Los Angeles Holding Company, Inc.
LOCATION: See Trench Location Map
LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 9/12/2012

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>SAMPLES</th>
<th>USCS Symbol</th>
<th>Field Testing</th>
<th>Laboratory Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample Type</td>
<td>Sample Number</td>
<td>Water Content (%)</td>
<td>Dry Density (pcf)</td>
</tr>
<tr>
<td></td>
<td>SP</td>
<td>Silty cobbly gravelly SAND (SP), gray brown, damp to dry, loose</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>GP</td>
<td>Silty cobbly sandy GRAVEL (GP), medium brown to red brown, slightly moist, medium dense, ~50% well rounded clasts up to 1&quot; in diameter with most 1 to 3&quot; in diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

TRENCH TERMINATED AT 6 FEET

No Groundwater Encountered
No Caving
Backfilled with Trench Spoils

LEGEND

Sample Types: ☒ — Ring Sample ☒ — Large Bulk Sample ☐ — Water Table
Laboratory Testing: AL = Atterberg Limits EI = Expansion Index MD = Maximum Density SA = Sieve Analysis
SR = Sulfate/Resistance Test SH = Shear Testing RV = R-Value Test CD = Consolidation
GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0904-CR3
PROJECT NAME: Baseline Grove
CLIENT: DR Horton Los Angeles Holding Company, Inc.
LOCATION: See Trench Location Map

LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 9/12/2012

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>SAMPLES</th>
<th>Field Testing</th>
<th>Laboratory Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Type</td>
<td>UCS Symbol</td>
<td>Water Content (%)</td>
<td>Dry Density (lb)</td>
</tr>
<tr>
<td>------------</td>
<td>------------</td>
<td>-------------------</td>
<td>------------------</td>
</tr>
<tr>
<td>0.0</td>
<td>Undocumented Fill:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>SP Silty cobbly gravelly SAND (SP), gray brown, damp to dry, loose</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.0</td>
<td>Alluvium:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3.0</td>
<td>GP Silty cobbly sandy GRAVEL (GP), yellow brown, dry to slightly moist, medium dense, ~60 to 70% well rounded calsis up to 16&quot; in diameter with most 1 to 4&quot; in diameter</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>TRENCH TERMINATED AT 6 FEET</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Groundwater Encountered</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor Caving @ 3 to 6&quot;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backfilled with Trench Spoils</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

LEGEND
- Sample Types:
  - Ring Sample
  - Large Bulk Sample
- Laboratory Testing:
  - AL = Atterberg Limits
  - EI = Expansion Index
  - MD = Maximum Density
  - SA = sieve Analysis
  - SR = Sulfate/Resistivity Test
  - SH = Shear Testing
  - RV = R-Value Test
  - CO = Consolidation
# GeoTek, Inc.
**LOG OF EXPLORATORY TRENCH**

**PROJECT NO.:** 0994-CR3  
**PROJECT NAME:** Baseline Grove  
**CLIENT:** DR Horton Los Angeles Holding Company, Inc.  
**LOCATION:** See Trench Location Map  
**LOGGED BY:** EHL  
**EQUIPMENT:** Backhoe  
**DATE:** 9/17/2012

## TRENCH NO.: T-4

### MATERIAL DESCRIPTION AND COMMENTS

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Sample Type</th>
<th>UEC Symbol</th>
<th>Field Testing</th>
<th>Laboratory Testing</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Water Content (g)</td>
<td>Dry Density (g/cc)</td>
<td></td>
</tr>
</tbody>
</table>

- **Undocumented Fill:**
  - SP: Silty gravelly SAND (SP), light gray, dry, loose

- **Alluvium:**
  - GP: Silty cobbly sandy GRAVEL (GP), yellow brown, dry to slightly moist, medium dense, ~60 to 70% well rounded clasts up to 10" in diameter with most 1 to 4" in diameter

  🍃, becomes moist with some larger clasts

---

**TRENCH TERMINATED AT 6 FEET**

- No Groundwater Encountered
- No Caving
- Backfilled with Trench Spoils

---

**LEGEND**

- Sample Types:  
  - **Ring Sample**  
  - **Large Bulk Sample**  
  - **Vector Table**

- Laboratory Testing:  
  - AL = Atterberg Limits  
  - E = Expansion Index  
  - MD = Maximum Density  
  - SA = Sieve Analysis  
  - SR = Sulfate/Resistivity Test  
  - SH = Shear Testing  
  - RV = R-Value Test  
  - CO = Consolidation

---

G-84
# GeoTek, Inc.
## LOG OF EXPLORATORY TRENCH

**PROJECT NO.:** 0904-CR3  
**LOGGED BY:** EHL  
**PROJECT NAME:** Baseline Groves  
**CLIENT:** DR Horton Los Angeles Holding Company, Inc.  
**EQUIPMENT:** Backhoe  
**DATE:** 9/12/2012  
**LOCATION:** See Trench Location Map

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>SAMPLES</th>
<th>USCS Symbol</th>
<th>Material Description and Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td><strong>Undocumented Fill</strong></td>
</tr>
<tr>
<td>5</td>
<td><strong>SP</strong></td>
<td></td>
<td>Silty gravelly SAND (SP), light gray, dry, loose</td>
</tr>
<tr>
<td>10</td>
<td><strong>GP</strong></td>
<td></td>
<td>Silty cobbly sandy GRAVEL (GP), yellow brown, dry to slightly moist, medium dense, ~60 to 70% well rounded clasts up to 10&quot; in diameter with most 1 to 4&quot; in diameter; practical refusal at 4 feet</td>
</tr>
</tbody>
</table>

**TRENCH TERMINATED AT 4 FEET**

No Groundwater Encountered  
No Caving  
Backfilled with Trench Spoils

---

**LEGEND**

- **Sample Types:**  
  - R - Ring Sample  
  - L - Large Bulk Sample  
  - W - Water Table  

- **Laboratory Testing:**  
  - AL = Atterberg Limits  
  - EI = Expansion Index  
  - MD = Maximum Density  
  - SA = Sone Analysis  
  - SR = Sulfate/Resistivity Test  
  - SH = Shear Testing  
  - RV = R-Value Test  
  - CO = Consolidation
GeoTek, Inc.
LOG OF EXPLORATORY TRENCH

PROJECT NO.: 0904-CR3
PROJECT NAME: Baseline Grove
CLIENT: DR Horton Los Angeles Holding Company, Inc.
LOCATION: Sea Trench Location Map

LOGGED BY: EHL
EQUIPMENT: Backhoe
DATE: 9/1/2012

### TRENCH NO.: T-6

<table>
<thead>
<tr>
<th>Depth (ft)</th>
<th>Samples</th>
<th>UDEC Symbol</th>
<th>Field Testing</th>
<th>Laboratory Testing</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Sample 1</td>
<td>Sample 2</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MATERIAL DESCRIPTION AND COMMENTS**

- **Undocumented Fill:**
  - **SP:** Silty gravelly SAND (SP), dark brown, moist, loose, rootlets

- **Colluvium:**
  - **SM:** Gravelly silty SAND (SM), dark brown, moist to very moist, loose

- **Alluvium:**
  - **SP:** Silty cobbley SAND (SP), medium yellow brown to dark gray brown, slightly moist, cobble clasts up to 6'; practical refusal at 5 feet

**TRENCH TERMINATED AT 5 FEET**

- No Groundwater Encountered
- No Caving
- Backfilled with Trench Spoils

---

**LEGEND**

- **Sample Types:**
  - ![Ring Sample](image)
  - ![Large Bulk Sample](image)
  - ![Water Table](image)

- **Laboratory Testing:**
  - AL = Atterberg Limits
  - BI = Expansion Index
  - MD = Maximum Density
  - SA = Sieve Analysis
  - SR = Sulfate/Resistivity Test
  - SH = Shear Testing
  - RV = R-Value Test
  - CO = Consolidation

---

G-86
APPENDIX B

LABORATORY TEST RESULTS

Baseline Grove Project
Claremont, Los Angeles County, California
Project No. 0904-CR3
SUMMARY OF LABORATORY TESTING

Classification
Soils were classified visually in general accordance to the Unified Soil Classification System (ASTM Test Method D 2487). The soil classifications are shown on the log of borings in Appendix A.

Expansion Index
Expansion Index testing was performed on a soil sample. Testing was performed in general accordance with ASTM Test Method D 4829. The result is included herein.

Moisture-Density Relationship
Laboratory testing was performed on a sample collected during the subsurface exploration. The laboratory maximum dry density and optimum moisture content for the soil type was determined in general accordance with test method ASTM Test Procedure D 1557. The results are included herein.

Sulfate Content
Analysis to determine the water-soluble sulfate content was performed by others in accordance with California Test No. 417. The results of the testing are included herein.

Chloride Content
Analysis to determine the water-soluble chloride content was performed by others in accordance with California Test No. 422. The results of the testing are included herein.

Resistivity and pH
A representative soil sample was tested by others for resistivity and pH in general accordance with California Test 643. The results of the testing are included herein.

Direct Shear
Shear testing was performed in a direct shear machine of the strain-control type in general accordance with ASTM Test Method D 3080. The rate of deformation is approximately 0.025 inches per minute. The samples were sheared under varying confining loads in order to determine the coulomb shear strength parameters, angle of internal friction and cohesion. One test was performed on a bulk sample that was remolded to 90 percent relative compaction. The shear test result is presented on Plate SH-1.
EXPANSION INDEX TEST  
(ASTM D4829)

Client: DR Horton  
Project Number: 0904-CR3  
Project Location: Baseline Grove, Claremont, CA

Ring #: _______ Ring Dia. : 4.01" Ring Ht.: 1"  
Loading weight: 5516. grams

**DENSITY DETERMINATION**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Weight of compacted sample &amp; ring (gm)</td>
<td>782.2</td>
</tr>
<tr>
<td>B</td>
<td>Weight of ring (gm)</td>
<td>363.7</td>
</tr>
<tr>
<td>C</td>
<td>Net weight of sample (gm)</td>
<td>418.5</td>
</tr>
<tr>
<td>D</td>
<td>Wet Density, lb / ft³ (C=0.3016)&quot;</td>
<td>128.4</td>
</tr>
<tr>
<td>E</td>
<td>Dry Density, lb / ft³ (D/F)</td>
<td>117.0</td>
</tr>
</tbody>
</table>

**SATURATION DETERMINATION**

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>F</td>
<td>Moisture Content, %</td>
<td>6.0</td>
</tr>
<tr>
<td>G</td>
<td>Specific Gravity, assumed</td>
<td>2.7</td>
</tr>
<tr>
<td>H</td>
<td>Unit Wt. of Water @ 20°C, (pdl)</td>
<td>62.3</td>
</tr>
<tr>
<td>I</td>
<td>% Saturation</td>
<td>49</td>
</tr>
</tbody>
</table>

**READINGS**

<table>
<thead>
<tr>
<th>DATE</th>
<th>TIME</th>
<th>READING</th>
</tr>
</thead>
<tbody>
<tr>
<td>9/17/2012</td>
<td>11:25</td>
<td>0.0840</td>
</tr>
<tr>
<td>9/17/2012</td>
<td>11:35</td>
<td>0.0840</td>
</tr>
<tr>
<td>9/17/2012</td>
<td>11:36</td>
<td>0.0840</td>
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<tr>
<td>9/17/2012</td>
<td>11:41</td>
<td>0.0840</td>
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<tr>
<td>9/17/2012</td>
<td>13:49</td>
<td>0.0840</td>
</tr>
<tr>
<td>9/18/2012</td>
<td>7:10</td>
<td>0.0840</td>
</tr>
</tbody>
</table>

**FINAL MOISTURE**

<table>
<thead>
<tr>
<th>Weight of wet sample &amp; tare</th>
<th>Weight of dry sample &amp; tare</th>
<th>Tare</th>
<th>% Moisture</th>
</tr>
</thead>
<tbody>
<tr>
<td>424.9</td>
<td>373.9</td>
<td></td>
<td>13.6%</td>
</tr>
</tbody>
</table>

**EXPANSION INDEX = 0**
MOISTURE/DENSITY RELATIONSHIP

Client: DR Horton
Project: Baseline Grove Project
Location: Claremont
Material Type: Dark Brown Silty Sand
Material Supplier: N/A
Material Source: N/A
Sample Location: T-2
Sampled By: EHL
Received By: N/A
Tested By: DI
Reviewed By: N/A
Date Sampled: 12-Sep-12
Date Received: 12-Sep-12
Date Tested: 17-Sep-12
Date Reviewed: 20-Sep-12

Test Procedure: ASTM 1557
Method: C
Oversized Material (%): 34.0
Correction Required: Yes

MOISTURE/DENSITY RELATIONSHIP CURVE

<table>
<thead>
<tr>
<th>DRY DENSITY (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CORRECTED DRY DENSITY (pcf):</td>
</tr>
<tr>
<td>ZERO AIR NULL DENSITY (pcf)</td>
</tr>
<tr>
<td>S.G. 2.7</td>
</tr>
<tr>
<td>S.G. 2.6</td>
</tr>
<tr>
<td>OVERSIZE CORRECTED</td>
</tr>
<tr>
<td>ZERO AIR Voids</td>
</tr>
<tr>
<td>Poly. (DRY DENSITY (pcf))</td>
</tr>
<tr>
<td>Poly. (S.G. 2.7)</td>
</tr>
<tr>
<td>Poly. (S.G. 2.6)</td>
</tr>
<tr>
<td>Poly. (S.G. 2.6)</td>
</tr>
</tbody>
</table>

Maximum Dry Density, pcf: 131.0
Corrected Maximum Dry Density, pcf: No
Optimum Moisture, %: 7.5

Grain Size Distribution:
- % Gravel (retained on No. 4)
- % Sand (Passing No. 4, Retained on No. 200)
- % Silt and Clay (Passing No. 200)

Atterberg Limits:
- Liquid Limit, %
- Plastic Limit, %
- Plasticity Index, %

Classification:
Unified Soils Classification:
AASHTO Soils Classification:

Plate MD-1
September 21, 2012

Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental & Civil Engineering

Geo Tek Inc.
710 East Parkridge Avenue, Suite 105
Corona, California 92879

Attn: Mr. Edward Lamont

RE: LABORATORY TEST RESULTS/REPORT

Client: DR. Horton
W.O. 0904- CR3
Project: Claremont
PO # 2747
QCI Job No.: 12-167-09f

Gentlemen:

We have completed the testing program conducted on sample from the above project. The tests were performed in accordance with testing procedures as follows:

<table>
<thead>
<tr>
<th>TEST</th>
<th>METHOD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corrosion Potential</td>
<td>CT- 417, CT- 422, CT-532 (643)</td>
</tr>
</tbody>
</table>

Enclosed is Summary of Laboratory Test Results.

We appreciate the opportunity to provide testing services to Geo Tek, Inc. Should you have any questions, please call the undersigned.

Respectfully submitted,
Cal Land Engineering, Inc. (CLE)
dba Quartech Consultants (QCI)

Abe Kazemzadeh
Laboratory Manager

Enclosure
Cal Land Engineering, Inc.
dba Quartech Consultants
Geotechnical, Environmental, and Civil Engineering

For: GeoTek, Inc.
W.O.: 0904 - CR3
Client: DR. Horton
Project: Claremont
PO # 2747

Date: September 21, 2012
QCI Project No.: 12-167-09f
Summarized by: ABK

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Depth (Feet)</th>
<th>pH CT-532 (643)</th>
<th>Chloride CT-422 (ppm)</th>
<th>Sulfate CT-417 (% by Weight)</th>
<th>Resistivity CT-532 (ohm-cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP-2</td>
<td>1 - 3</td>
<td>7.64</td>
<td>36</td>
<td>0.0025</td>
<td>3,800</td>
</tr>
</tbody>
</table>
DIRECT SHEAR TEST

Client: DR. Horton
Sample Source: T-2 @ 1'-3'
Project Number: 0904-CR3
Date Tested: 9/19/2012
Soil Description: Silty Sand

Shear Strength: \( \phi = 32.7^\circ \quad c = 0.00 \text{ ksf} \)

<table>
<thead>
<tr>
<th>Test No.</th>
<th>Load (ksf)</th>
<th>Water Content (%)</th>
<th>Dry Density (pcf)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.4</td>
<td>16.1</td>
<td>112.1</td>
</tr>
<tr>
<td>2</td>
<td>2.8</td>
<td>15.5</td>
<td>112.1</td>
</tr>
<tr>
<td>3</td>
<td>5.5</td>
<td>14.9</td>
<td>112.4</td>
</tr>
</tbody>
</table>

Notes:
1. The soil specimen used in the shear box was a ring sample remolded from a bulk sample collected during the field investigation.
2. The above reflect residual shear strength at saturated conditions.
3. The tests were run at a shear rate of 0.025 in/min.

PLATE SH-I
APPENDIX C

GENERAL GRADING GUIDELINES

Baseline Grove Project
Claremont, Los Angeles County, California
Project No. 0904-CR3
GENERAL GRADING GUIDELINES

Guidelines presented herein are intended to address general construction procedures for earthwork construction. Specific situations and conditions often arise which cannot reasonably be discussed in general guidelines, when anticipated these are discussed in the text of the report. Often unanticipated conditions are encountered which may necessitate modification or changes to these guidelines. It is our hope that these will assist the contractor to more efficiently complete the project by providing a reasonable understanding of the procedures that would be expected during earthwork and the testing and observation used to evaluate those procedures.

General

Grading should be performed to at least the minimum requirements of governing agencies, Chapters 18 and 33 of the Uniform Building Code, CBC (2010) and the guidelines presented below.

Preconstruction Meeting

A preconstruction meeting should be held prior to site earthwork. Any questions the contractor has regarding our recommendations, general site conditions, apparent discrepancies between reported and actual conditions and/or differences in procedures the contractor intends to use should be brought up at that meeting. The contractor (including the main onsite representative) should review our report and these guidelines in advance of the meeting. Any comments the contractor may have regarding these guidelines should be brought up at that meeting.

Grading Observation and Testing

1. Observation of the fill placement should be provided by our representative during grading. Verbal communication during the course of each day will be used to inform the contractor of test results. The contractor should receive a copy of the "Daily Field Report" indicating results of field density tests that day. If our representative does not provide the contractor with these reports, our office should be notified.

2. Testing and observation procedures are, by their nature, specific to the work or area observed and location of the tests taken, variability may occur in other locations. The contractor is responsible for the uniformity of the grading operations; our observations and test results are intended to evaluate the contractor's overall level of efforts during grading. The contractor's personnel are the only individuals participating in all aspect of site work. Compaction testing and observation should not be considered as relieving the contractor's responsibility to properly compact the fill.

3. Cleanouts, processed ground to receive fill, key excavations, and subdrains should be observed by our representative prior to placing any fill. It will be the contractor's responsibility to notify our representative or office when such areas are ready for observation.

4. Density tests may be made on the surface material to receive fill, as considered warranted by this firm.
5. In general, density tests would be made at maximum intervals of two feet of fill height or every 1,000 cubic yards of fill placed. Criteria will vary depending on soil conditions and size of the fill. More frequent testing may be performed. In any case, an adequate number of field density tests should be made to evaluate the required compaction and moisture content is generally being obtained.

6. Laboratory testing to support field test procedures will be performed, as considered warranted, based on conditions encountered (e.g. change of material sources, types, etc.) Every effort will be made to process samples in the laboratory as quickly as possible and in progress construction projects are our first priority. However, laboratory workloads may cause delays and some soils may require a minimum of 48 to 72 hours to complete test procedures. Whenever possible, our representative(s) should be informed in advance of operational changes that might result in different source areas for materials.

7. Procedures for testing of fill slopes are as follows:
   a) Density tests should be taken periodically during grading on the flat surface of the fill, three to five feet horizontally from the face of the slope.
   b) If a method other than over building and cutting back to the compacted core is to be employed, slope compaction testing during construction should include testing the outer six inches to three feet in the slope face to determine if the required compaction is being achieved.

8. Finish grade testing of slopes and pad surfaces should be performed after construction is complete.

Site Clearing

1. All vegetation, and other deleterious materials, should be removed from the site. If material is not immediately removed from the site it should be stockpiled in a designated area(s) well outside of all current work areas and delineated with flagging or other means. Site clearing should be performed in advance of any grading in a specific area.

2. Efforts should be made by the contractor to remove all organic or other deleterious material from the fill, as even the most diligent efforts may result in the incorporation of some materials. This is especially important when grading is occurring near the natural grade. All equipment operators should be aware of these efforts. Laborers may be required as root pickers.

3. Nonorganic debris or concrete may be placed in deeper fill areas provided the procedures used are observed and found acceptable by our representative. Typical procedures are similar to those indicated on Plate G-4.

Treatment of Existing Ground

1. Following site clearing, all surficial deposits of alluvium and colluvium as well as weathered or creep effected bedrock, should be removed (see Plates G-1, G-2 and G-3) unless otherwise specifically indicated in the text of this report.

GEOTEK
GENERAL GRADING GUIDELINES
Preliminary Geotechnical Evaluation
Baseline Grove Project, Claremont, California

APPENDIX C
Project No. 0904-CR3

Page C-3

2. In some cases, removal may be recommended to a specified depth (e.g. flat sites where partial alluvial removals may be sufficient). The contractor should not exceed these depths unless directed otherwise by our representative.

3. Groundwater existing in alluvial areas may make excavation difficult. Deeper removals than indicated in the text of the report may be necessary due to saturation during winter months.

4. Subsequent to removals, the natural ground should be processed to a depth of six inches, moistened to near optimum moisture conditions and compacted to fill standards.

5. Exploratory back hoe or dozer trenches still remaining after site removal should be excavated and filled with compacted fill if they can be located.

Subdrainage

1. Subdrainage systems should be provided in canyon bottoms prior to placing fill, and behind buttress and stabilization fills and in other areas indicated in the report. Subdrains should conform to schematic diagrams G-1 and G-5, and be acceptable to our representative.

2. For canyon subdrains, runs less than 500 feet may use six-inch pipe. Typically, runs in excess of 500 feet should have the lower end as eight-inch minimum.

3. Filter material should be clean, 1/2 to 1-inch gravel wrapped in a suitable filter fabric. Class 2 permeable filter material per California Department of Transportation Standards tested by this office to verify its suitability, may be used without filter fabric. A sample of the material should be provided to the Soils Engineer by the contractor at least two working days before it is delivered to the site. The filter should be clean with a wide range of sizes.

4. Approximate delineation of anticipated subdrain locations may be offered at 40-scale plan review stage. During grading, this office would evaluate the necessity of placing additional drains.

5. All subdrainage systems should be observed by our representative during construction and prior to covering with compacted fill.

6. Subdrains should outlet into storm drains where possible. Outlet should be located and protected. The need for backflow preventers should be assessed during construction.

7. Consideration should be given to having subdrains located by the project surveyors.

Fill Placement

1. Unless otherwise indicated, all site soil and bedrock may be reused for compacted fill; however, some special processing or handling may be required (see text of report).

2. Material used in the compacting process should be evenly spread, moisture conditioned, processed, and compacted in thin lifts six (6) to eight (8) inches in compacted thickness to obtain a uniformly dense layer. The fill should be placed and compacted on a nearly horizontal plane, unless otherwise found acceptable by our representative.

3. If the moisture content or relative density varies from that recommended by this firm, the contractor should rework the fill until it is in accordance with the following:

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GEOTEK
a) Moisture content of the fill should be at or above optimum moisture. Moisture should be evenly distributed without wet and dry pockets. Pre-watering of cut or removal areas should be considered in addition to watering during fill placement, particularly in clay or dry surficial soils. The ability of the contractor to obtain the proper moisture content will control production rates.

b) Each six-inch layer should be compacted to at least 90 percent of the maximum dry density in compliance with the testing method specified by the controlling governmental agency. In most cases, the testing method is ASTM Test Designation D 1557.

4. Rock fragments less than eight inches in diameter may be utilized in the fill, provided:
   a) They are not placed in concentrated pockets;
   b) There is a sufficient percentage of fine-grained material to surround the rocks;
   c) The distribution of the rocks is observed by, and acceptable to, our representative.

5. Rocks exceeding eight (8) inches in diameter should be taken off site, broken into smaller fragments, or placed in accordance with recommendations of this firm in areas designated suitable for rock disposal (see Plate G-4). On projects where significant large quantities of oversized materials are anticipated, alternate guidelines for placement may be included. If significant oversize materials are encountered during construction, these guidelines should be requested.

6. In clay soil, dry or large chunks or blocks are common. If in excess of eight (8) inches minimum dimension, then they are considered as oversized. Sheepsfoot compactors or other suitable methods should be used to break up blocks. When dry, they should be moisture conditioned to provide a uniform condition with the surrounding fill.

Slope Construction

1. The contractor should obtain a minimum relative compaction of 90 percent out to the finished slope face of fill slopes. This may be achieved by either overbuilding the slope and cutting back to the compacted core, or by direct compaction of the slope face with suitable equipment.

2. Slopes trimmed to the compacted core should be overbuilt by at least three (3) feet with compaction efforts out to the edge of the false slope. Failure to properly compact the outer edge results in trimming not exposing the compacted core and additional compaction after trimming may be necessary.

3. If fill slopes are built "at grade" using direct compaction methods, then the slope construction should be performed so that a constant gradient is maintained throughout construction. Soil should not be "spilled" over the slope face nor should slopes be "pushed out" to obtain grades. Compaction equipment should compact each lift along the immediate top of slope. Slopes should be back rolled or otherwise compacted at approximately every 4 feet vertically as the slope is built.

4. Corners and bends in slopes should have special attention during construction as these are the most difficult areas to obtain proper compaction.

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5. Cut slopes should be cut to the finished surface. Excessive undercutting and smoothing of the face with fill may necessitate stabilization.

Keyways, Buttress and Stabilization Fills

Keyways are needed to provide support for fill slope and various corrective procedures.

1. Side-hill fills should have an equipment-width key at their toe excavated through all surficial soil and into competent material and tilted back into the hill (Plates G-2, G-3). As the fill is elevated, it should be benched through surficial soil and slopewash, and into competent bedrock or other material deemed suitable by our representatives (See Plates G-1, G-2, and G-3).

2. Fill over cut slopes should be constructed in the following manner:
   a) All surficial soils and weathered rock materials should be removed at the cut-fill interface.
   b) A key at least one and one-half (1.5) equipment width wide (or as needed for compaction), and tipped at least one (1) foot into slope, should be excavated into competent materials and observed by our representative.
   c) The cut portion of the slope should be excavated prior to fill placement to evaluate if stabilization is necessary. The contractor should be responsible for any additional earthwork created by placing fill prior to cut excavation. (see Plate G-3 for schematic details.)

3. Daylight cut lots above descending natural slopes may require removal and replacement of the outer portion of the lot. A schematic diagram for this condition is presented on Plate G-2.

4. A basal key is needed for fill slopes extending over natural slopes. A schematic diagram for this condition is presented on Plate G-2.

5. All fill slopes should be provided with a key unless within the body of a larger overall fill mass. Please refer to Plate G-3 for specific guidelines.

Anticipated buttress and stabilization fills are discussed in the text of the report. The need to stabilize other proposed cut slopes will be evaluated during construction. Plate G-5 shows a schematic of buttress construction.

1. All backcuts should be excavated at gradients of 1:1 or flatter. The backcut configuration should be determined based on the design, exposed conditions, and need to maintain a minimum fill width and provide working room for the equipment.

2. On longer slopes, backcuts and keyways should be excavated in maximum 250 feet long segments. The specific configurations will be determined during construction.

3. All keys should be a minimum of two (2) feet deep at the toe and slope toward the heel at least one foot or two (2%) percent, whichever is greater.

4. Subdrains are to be placed for all stabilization slopes exceeding 10 feet in height. Lower slopes are subject to review. Drains may be required. Guidelines for subdrains are presented on Plate G-5.
5. Benching of backcuts during fill placement is required.

Lot Capping

1. When practical, the upper three (3) feet of material placed below finish grade should be comprised of the least expansive material available. Preferably, highly and very highly expansive materials should not be used. We will attempt to offer advise based on visual evaluations of the materials during grading, but it must be realized that laboratory testing is needed to evaluate the expansive potential of soil. Minimally, this testing takes two (2) to four (4) days to complete.

2. Transition lots (cut and fill) both per plan and those created by remedial grading (e.g. lots above stabilization fills, along daylight lines, above natural slopes, etc.) should be capped with a minimum three foot thick compacted fill blanket.

3. Cut pads should be observed by our representative(s) to evaluate the need for overexcavation and replacement with fill. This may be necessary to reduce water infiltration into highly fractured bedrock or other permeable zones, and/or due to differing expansive potential of materials beneath a structure. The overexcavation should be at least three feet. Deeper overexcavation may be recommended in some cases.

ROCK PLACEMENT AND ROCK FILL GUIDELINES

It is anticipated that large quantities of oversize material would be generated during grading. It's likely that such materials may require special handling for burial. Although alternatives may be developed in the field, the following methods of rock disposal are recommended on a preliminary basis.

Limited Larger Rock

When materials encountered are principally soil with limited quantities of larger rock fragments or boulders, placement in windrows is recommended. The following procedures should be applied:

1. Oversize rock (greater than 8 inches) should be placed in windrows,
   a) Windrows are rows of single file rocks placed to avoid nesting or clusters of rock.
   b) Each adjacent rock should be approximately the same size (within ~one foot in diameter).
   c) The maximum rock size allowed in windrows is four feet.

2. A minimum vertical distance of three feet between lifts should be maintained. Also, the windrows should be offset from lift to lift. Rock windrows should not be closer than 15 feet to the face of fill slopes and sufficient space must be maintained for proper slope construction (see Plate G-4).

3. Rocks greater than eight inches in diameter should not be placed within seven feet of the finished subgrade for a roadway or pads and should be held below the depth of the lowest utility. This will allow easier trenching for utility lines.
4. Rocks greater than four feet in diameter should be broken down, if possible, or they may be placed in a dozer trench. Each trench should be excavated into the compacted fill a minimum of one foot deeper than the largest diameter of rock.
   a) The rock should be placed in the trench and granular fill materials (SE>30) should be flooded into the trench to fill voids around the rock.
   b) The over size rock trenches should be no closer together than 15 feet from any slope face.
   c) Trenches at higher elevation should be staggered and there should be a minimum of four feet of compacted fill between the top of the one trench and the bottom of the next higher trench.
   d) It would be necessary to verify 90 percent relative compaction in these pits. A 24 to 72 hour delay to allow for water dissipation should be anticipated prior to additional fill placement.

Structural Rock Fills

If the materials generated for placement in structural fills contains a significant percentage of material more than six (6) inches in one dimension, then placement using conventional soil fill methods with isolated windrows would not be feasible. In such cases the following could be considered:

1. Mixes of large rock or boulders may be placed as rock fill. They should be below the depth of all utilities both on pads and in roadways and below any proposed swimming pools or other excavations. If these fills are placed within seven (7) feet of finished grade, they may effect foundation design.

2. Rock fills are required to be placed in horizontal layers that should not exceed two feet in thickness, or the maximum rock size present, which ever is less. All rocks exceeding two feet should be broken down to a smaller size, windrowed (see above), or disposed of in non-structural fill areas. Localized larger rock up to 3 feet in largest dimension may be placed in rock fill as follows:
   a) individual rocks are placed in a given lift so as to be roughly 50% exposed above the typical surface of the fill,
   b) loaded rock trucks or alternate compactors are worked around the rock on all sides to the satisfaction of the soil engineer,
   c) the portion of the rock above grade is covered with a second lift.

3. Material placed in each lift should be well graded. No unfilled spaces (voids) should be permitted in the rock fill.

Compaction Procedures

Compaction of rock fills is largely procedural. The following procedures have been found to generally produce satisfactory compaction.

1. Provisions for routing of construction traffic over the fill should be implemented.
a) Placement should be by rock trucks crossing the lift being placed and dumping at its edge.
b) The trucks should be routed so that each pass across the fill is via a different path and that all areas are uniformly traversed.
c) The dumped piles should be knocked down and spread by a large dozer (D-8 or larger suggested). (Water should be applied before and during spreading.)

2. Rock fill should be generously watered (sluiced)
a) Water should be applied by water trucks to the:
   i) dump piles,
   ii) front face of the lift being placed and,
   iii) surface of the fill prior to compaction.
b) No material should be placed without adequate water.
c) The number of water trucks and water supply should be sufficient to provide constant water.
d) Rock fill placement should be suspended when water trucks are unavailable:
   i) for more than 5 minutes straight, or,
   ii) for more than 10 minutes/hour.

3. In addition to the truck pattern and at the discretion of the soil engineer, large, rubber tired compactors may be required.
a) The need for this equipment will depend largely on the ability of the operators to provide complete and uniform coverage by wheel rolling with the trucks.
b) Other large compactors will also be considered by the soil engineer provided that required compaction is achieved.

4. Placement and compaction of the rock fill is largely procedural. Observation by trenching should be made to check:
a) the general segregation of rock size,
b) for any unfilled spaces between the large blocks, and
c) the matrix compaction and moisture content.

5. Test fills may be required to evaluate relative compaction of finer grained zones or as deemed appropriate by the soil engineer.
a) A lift should be constructed by the methods proposed, as proposed

6. Frequency of the test trenching is to be at the discretion of the soil engineer. Control areas may be used to evaluate the contractors procedures.

7. A minimum horizontal distance of 15 feet should be maintained from the face of the rock fill and any finish slope face. At least the outer 15 feet should be built of conventional fill materials.

Piping Potential and Filter Blankets
Where conventional fill is placed over rock fill, the potential for piping (migration) of the fine grained material from the conventional fill into rock fills will need to be addressed.
The potential for particle migration is related to the grain size comparisons of the materials present and in contact with each other. Provided that 15 percent of the finer soil is larger than the effective pore size of the coarse soil, then particle migration is substantially mitigated. This can be accomplished with a well-graded matrix material for the rock fill and a zone of fill similar to the matrix above it. The specific gradation of the fill materials placed during grading must be known to evaluate the need for any type of filter that may be necessary to cap the rock fills. This, unfortunately, can only be accurately determined during construction.

In the event that poorly graded matrix is used in the rock fills, properly graded filter blankets 2 to 3 feet thick separating rock fills and conventional fill may be needed. As an alternative, use of two layers of filter fabric (Mirafi 700 x or equivalent) could be employed on top of the rock fill. In order to mitigate excess puncturing, the surface of the rock fill should be well broken down and smoothed prior to placing the filter fabric. The first layer of the fabric may then be placed and covered with relatively permeable fill material (with respect to overlying material) 1 to 2 feet thick. The relative permeable material should be compacted to fill standards. The second layer of fabric should be placed and conventional fill placement continued.

**Subdrainage**

Rock fill areas should be tied to a subdrainage system. If conventional fill is placed that separates the rock from the main canyon subdrain, then a secondary system should be installed. A system consisting of an adequately graded base (3 to 4 percent to the lower side) with a collector system and outlets may suffice.

Additionally, at approximately every 25 foot vertical interval, a collector system with outlets should be placed at the interface of the rock fill and the conventional fill blanketing a fill slope.

**Monitoring**

Depending upon the depth of the rock fill and other factors, monitoring for settlement of the fill areas may be needed following completion of grading. Typically, if rock fill depths exceed 40 feet, monitoring would be recommended prior to construction of any settlement sensitive improvements. Delays of 3 to 6 months or longer can be expected prior to the start of construction.

**UTILITY TRENCH CONSTRUCTION AND BACKFILL**

Utility trench excavation and backfill is the contractors responsibility. The geotechnical consultant typically provides periodic observation and testing of these operations. While efforts are made to make sufficient observations and tests to verify that the contractors' methods and procedures are adequate to achieve proper compaction, it is typically impractical to observe all backfill procedures. As such, it is critical that the contractor use consistent backfill procedures.
Compaction methods vary for trench compaction and experience indicates many methods can be successful. However, procedures that “worked” on previous projects may or may not prove effective on a given site. The contractor(s) should outline the procedures proposed, so that we may discuss them prior to construction. We will offer comments based on our knowledge of site conditions and experience.

1. Utility trench backfill in slopes, structural areas, in streets and beneath flat work or hardscape should be brought to at least optimum moisture and compacted to at least 90 percent of the laboratory standard. Soil should be moisture conditioned prior to placing in the trench.

2. Flooding and jetting are not typically recommended or acceptable for native soils. Flooding or jetting may be used with select sand having a Sand Equivalent (SE) of 30 or higher. This is typically limited to the following uses:
   a) shallow (12 + inches) under slab interior trenches and,
   b) as bedding in pipe zone.

   The water should be allowed to dissipate prior to pouring slabs or completing trench compaction.

3. Care should be taken not to place soils at high moisture content within the upper three feet of the trench backfill in street areas, as overly wet soils may impact subgrade preparation. Moisture may be reduced to 2% below optimum moisture in areas to be paved within the upper three feet below sub grade.

4. Sand backfill should not be allowed in exterior trenches adjacent to and within an area extending below a 1:1 projection from the outside bottom edge of a footing, unless it is similar to the surrounding soil.

5. Trench compaction testing is generally at the discretion of the geotechnical consultant. Testing frequency will be based on trench depth and the contractors procedures. A probing rod would be used to assess the consistency of compaction between tested areas and untested areas. If zones are found that are considered less compact than other areas, this would be brought to the contractors attention.

**JOB SAFETY**

**General**

Personnel safety is a primary concern on all job sites. The following summaries are safety considerations for use by all our employees on multi-employer construction sites. On ground personnel are at highest risk of injury and possible fatality on grading construction projects. The company recognizes that construction activities will vary on each site and that job site safety is the contractor's responsibility. However, it is, imperative that all personnel be safety conscious to avoid accidents and potential injury.
In an effort to minimize risks associated with geotechnical testing and observation, the following precautions are to be implemented for the safety of our field personnel on grading and construction projects.

1. Safety Meetings: Our field personnel are directed to attend the contractor's regularly scheduled safety meetings.

2. Safety Vests: Safety vests are provided for and are to be worn by our personnel while on the job site.

3. Safety Flags: Safety flags are provided to our field technicians; one is to be affixed to the vehicle when on site, the other is to be placed atop the spoil pile on all test pits.

In the event that the contractor's representative observes any of our personnel not following the above, we request that it be brought to the attention of our office.

Test Pits Location, Orientation and Clearance

The technician is responsible for selecting test pit locations. The primary concern is the technician's safety. However, it is necessary to take sufficient tests at various locations to obtain a representative sampling of the fill. As such, efforts will be made to coordinate locations with the grading contractors authorized representatives (e.g., dump man, operator, supervisor, grade checker, etc.), and to select locations following or behind the established traffic pattern, preferably outside of current traffic. The contractors authorized representative should direct excavation of the pit and safety during the test period. Again, safety is the paramount concern.

Test pits should be excavated so that the spoil pile is placed away from oncoming traffic. The technician's vehicle is to be placed next to the test pit, opposite the spoil pile. This necessitates that the fill be maintained in a drivable condition. Alternatively, the contractor may opt to park a piece of equipment in front of test pits, particularly in small fill areas or those with limited access.

A zone of non-encroachment should be established for all test pits (see diagram below). No grading equipment should enter this zone during the test procedure. The zone should extend outward to the sides approximately 50 feet from the center of the test pit and 100 feet in the direction of traffic flow. This zone is established both for safety and to avoid excessive ground vibration, which typically decreases test results.
TEST PIT SAFETY PLAN

Slope Tests
When taking slope tests, the technician should park their vehicle directly above or below the test location on the slope. The contractor's representative should ensure all equipment is at a safe operation distance (e.g., 50 feet) away from the slope during testing.

The technician is directed to withdraw from the active portion of the fill as soon as possible following testing. The technician's vehicle should be parked at the perimeter of the fill in a highly visible location.

Trench Safety
It is the contractor's responsibility to provide safe access into trenches where compaction testing is needed. Trenches for all utilities should be excavated in accordance with CAL-OSHA and any other applicable safety standards. Safe conditions will be required to enable compaction testing of the trench backfill.

All utility trench excavations in excess of 5 feet deep, which a person enters, are to be shored or laid back. Trench access should be provided in accordance with OSHA standards. Our personnel are directed not to enter any trench by being lowered or "riding down" on the equipment.

Our personnel are directed not to enter any excavation which:
1. is 5 feet or deeper unless shored or laid back,
2. exit points or ladders are not provided,
3. displays any evidence of instability, has any loose rock or other debris which could fall into the trench, or
4. displays any other evidence of any unsafe conditions regardless of depth.
If the contractor fails to provide safe access to trenches for compaction testing, our company policy requires that the soil technician withdraws and notifies their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. All backfill not tested due to safety concerns or other reasons is subject to reprocessing and/or removal.

**Procedures**

In the event that the technician's safety is jeopardized or compromised as a result of the contractor's failure to comply with any of the above, the technician is directed to inform both the developer's and contractor's representatives. If the condition is not rectified, the technician is required, by company policy, to immediately withdraw and notify their supervisor. The contractor's representative will then be contacted in an effort to effect a solution. No further testing will be performed until the situation is rectified. Any fill placed in the interim can be considered unacceptable and subject to reprocessing, recompaction or removal.

In the event that the soil technician does not comply with the above or other established safety guidelines, we request that the contractor bring this to technicians' attention and notify our project manager or office. Effective communication and coordination between the contractor's representative and the field technician(s) is strongly encouraged in order to implement the above safety program and safety in general.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.

The safety procedures outlined above should be discussed at the contractor's safety meetings. This will serve to inform and remind equipment operators of these safety procedures particularly the zone of non-encroachment.
ALTERNATE

CONSTRUCT BENCHES WHERE SLOPE EXCEEDS 5:1

BOTTOM OF CLEANOUT TO BE AT LEAST 1.5 TIMES THE WIDTH OF COMPACTION EQUIPMENT

6" PERFORATED PIPE IN 8 CUBIC FEET PER LINEAL FOOT CLEAN GRAVEL WITH FILTER FABRIC TO COVER SURFACE OR COMPLETE WRAP PER FIELD CONDITIONS

ALTERNATE

CONSTRUCT BENCHES WHERE SLOPE EXCEEDS 5:1

BOTTOM OF CLEANOUT TO BE AT LEAST 1.5 TIMES THE WIDTH OF COMPACTION EQUIPMENT

6" PERFORATED PIPE IN 9 CUBIC FEET PER LINEAL FOOT CLEAN GRAVEL WRAPPED IN FILTER FABRIC

STANDARD GRADING GUIDELINES

GeoTek, Inc.

TYPICAL CANYON CLEANOUT

PLATE G-1
CROSS SECTIONAL VIEW

FINISH GRADE

SEE NOTE 1

NO ROCKS IN THIS ZONE

FILL SLOPE

3' MIN

STAGGER ROWS HORIZONTALLY

3' MIN

MINIMUM 15' FT CLEAR OR 1.5 EQUIPMENT WIDTHS FOR COMPACTION

PLAN VIEW

FILL SLOPE

MINIMUM 15' FT CLEAR OR 1.5 EQUIPMENT WIDTHS FOR COMPACTION

PLACE ROCKS END TO END, DO NOT PILE OR STACK.

MINIMUM 15' FT CLEAR OR 1.5 EQUIPMENT WIDTHS FOR COMPACTION

SOIL TO BE PLACED AROUND AND OVER ROCKS AND FLOODED INTO VOIDS, COMPACT AROUND AND OVER EACH WINDROW

NOTES:
1) MINIMUM SOIL FILL OVER WINDROWS SHOULD BE 7 FEET AND SUFFICIENT FOR FUTURE EXCAVATIONS (e.g., SWIMMING POOLS) TO AVOID ROCKS.
2) MAXIMUM ROCK SIZE IN WINDROWS IS 4 FEET MINIMUM DIAMETER.
3) SOIL AROUND WINDROWS TO BE SANDY MATERIAL SUBJECT TO ACCEPTANCE BY SOIL ENGINEER.
4) ALL SPACING AND CLEARANCES MUST BE SUFFICIENT TO ALLOW FOR PROPER COMPACTION.

STANDARD GRADING GUIDELINES

GeoTek, Inc.

ROCK BURIAL DETAILS

PLATE G-4
GRADE TO DRAIN

COMPACTED FILL

MINIMUM 36" COMPACTED FILL BLANKET

FINISHED SLOPE FACE

TERRACE DRAIN AS REQUIRED

GRADE TO DRAIN

KEY TO FALL TO HEEL MINIMUM 1 FT

KEY TO BE MINIMUM 15 FT PLUS WIDTH OF TERRACE DRAINS OR 1.5 EQUIPMENT WIDTH USED FOR COMPACTION

KEY TO BE MINIMUM 2 FT DEEP OR PER REPORT

2%
MINIMUM FALL

4" DIAMETER PERFORATED DRAIN PIPE PVC SCH. 40 OR EQUIVALENT IN 6 CUBIC FT DRAIN ROCK WRAPPED IN FILTER FABRIC

4" DIAMETER SOLID OUTLET LATERALS TO SLOPE FACE OR STORM DRAIN SYSTEM AT MAXIMUM 100 FT INTERVALS

NOTE: ADDITIONAL BACKDRAINS MAY BE RECOMMENDED

STANDARD GRADING GUIDELINES

GeoTek, Inc.

PLATE G - 5
SUSMP Maintenance Covenant
STANDARD URBAN STORMWATER MITIGATION PLAN

BASE

LINE

ROAD

SCALE: 1" = 50'

LEGEND

STORMTICH CHAMBER
INFECTION

CB CATCH BASIN

AJJC DRAINAGE SUBAREA

TRACT MAP 27278

TRACT 72539

SUSMP

PREPARED FOR:

America's Builder

PREPARED FOR:

D.R. HORTON

PIEB & ASSOCIATES, INC.

PREPARED FOR:

D.R. HORTON

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PROPOSED LAYOUT:
(39) STORMTECH MC-400 CHAMBERS
(4) STORMTECH MC-400 END CAPS
INSTALLED WITH 16" COVER STONE, 16" BASE STONE, 45% STONE VOID
INSTALLED SYSTEM VOLUME (INCLUDING PERIMETER STONES): 7,410 CF

NOTES:
A. DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT & COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
B. THE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBERS COVER REQUIREMENTS ARE MET.

AD S N-12
(SIZE TBD BY ENGINEER
(TYP.)

CATCH BASIN

OUTLET
(PER ENGINEER'S PLAN/
PROVIDED BY OTHERS/
TYP.)

24" BOTTOM CORED END CAP
TYP. OF ALL MC-4000 24" AND ISOLATOR ROW CONNECTIONS

ISOLATOR ROW (TYP.)

INSPECTION PORT (TYP.)

24" BOTTOM CORED END CAP
TYP. OF ALL MC-4000 24" AND ISOLATOR ROW CONNECTIONS

CATCH BASIN

CATCH BASIN

CLAREMONT TENTATIVE 72539 - CA

DATE: 10-30-19
DESIGN: NTS
CHECKED:

DescripTion: "FLOODSTORM CATCH IT!" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

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